Concrete

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Advances in Structural Concrete in 1929

Developments in Quality Control—Aggressive Promotion of High Early Strength Cements—Admixtures and Curing Methods Being Studied—Use of Ready-Mixed Concrete on Increase—Transporting Concrete with Belt Conveyors—Light-Weight Aggregates—Steel-Core Columns—Concrete-Encased Steel Beams—New York and Chicago to Have New Building Codes—Notable Structures

STRUCTURAL concrete work has undergone definite improvement in construction methods and equipment during 1929, and further progress has been made toward the solution of difficulties that continue to confront architects, engineers and contractors who deal with this branch of the construction industry.

Strength-Controlled Concrete

Among the large projects on which strength-controlled concrete was placed, railway construction projects again stand out prominently. One of these comprised a number of separate bridge and viaduct structures on the Morris and Essex division of the Lackawanna R. R. Another was a new railway construction project known as the Connellsville extension of the Pittsburgh and West Virginia Ry. The latter project utilized centrally mixed concrete exclusively, as mentioned under another heading in this review.

High Early Strength Concrete

Both standard and special cements have been promoted aggressively in the field of high early strength concrete. Here the field is a special one, but it is constantly being enlarged as the advantages of early working strength become better understood and appreciated. Definite progress has been made also in the development of specifications covering high early strength cements.

Admixtures

There has been considerable discussion, both pro and con, concerning the value of admixtures. The most definite result growing out of these discussions is the feeling that all admixtures should be classified under general types, and specifications established for each type, by some standardizing agency of recognized authority.

Curing Methods

The curing of freshly placed concrete in buildings and similar structures was for many years a neglected phase of construction. This subject has been given attention for several years past, and within the last year perceptible progress has been made in the commercial development of better curing methods. This question will doubtless receive further study and development.

Richfield Building, Los Angeles. A striking effect was obtained by the use of dark mineral colors and special forms

Ready-Mixed Concrete

The use of ready-mixed concrete on structural work made a most decided advance during 1929. A Philadelphia concern sold 250,000 cu. yd. in that city, and is installing additional equipment to take care of an expected volume of 400,000 cu. yd. in 1930. An Indianapolis company which has been in business about 5 years reports the sale of 50,300 cu. yd. of ready-mixed concrete during 1929.

In the discussion of ready-mixed concrete it is now necessary to make a distinction between centrally mixed concrete and concrete that is mixed in transit. The former is mixed at the central plant, discharged into trucks and hauled to its destination in mixed form. The latter is mixed in specially-designed concrete mixers mounted on trucks, the actual mixing taking place while the truck is in transit from the material-storage bins to the place of delivery. Transit mixing trucks of this type have undergone much improvement and development during the year, several new models having appeared on the equipment market for the first time.

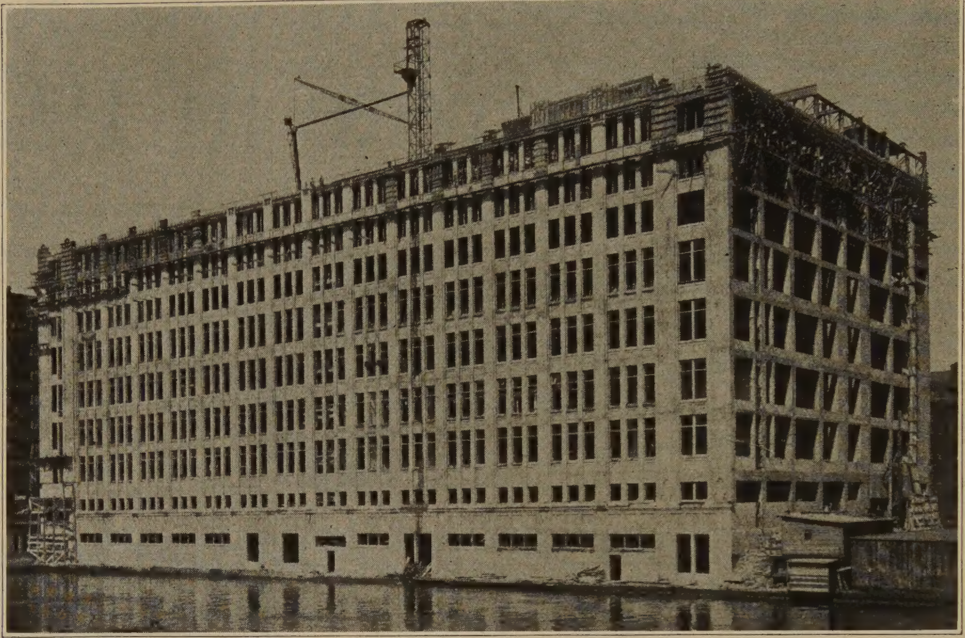
An illustration of the rapid progress being made in the marketing of ready-mixed concrete may be seen in a statement made to the writer by a prominent New York architect. A few years ago, he said, the use of such concrete was practically unknown in New York; but in 1929 one could see the trucks of ready-mixed concrete companies in the vicinity of almost every large construction project in Manhattan.

New Concrete Conveying Method

The year just closed saw the successful introduction of belt conveyors for distributing concrete on large projects. This method made its first appearance on the construction of the Merchandise Mart, in Chicago, said to be the largest building in existence in point of floor area. The conveyors were devised and designed by the general contractor's own engineering organization, acting in co-operation with the engineering department of an equipment manufacturer in whose plant the conveyor units were built. This equipment and the conveying methods employed are described in the October (1929) issue of CONCRETE.

Light-Weight Aggregates

The past year has seen the further development of light-weight aggregates. The manufacturers of haydite organized an association early in the year to promote the use of that material. A slag aggregate produced by a special process has been aggressively promoted under the trade name of pottsco. The field for cinder aggregates has been enlarged. The light-weight concrete known as aerocrete was tested and approved by the New York Bureau of Buildings for structural use as well as for fireproofing. Light-weight aggregates in general have made good progress in their special fields, namely, where weight or insulation are important factors.



This new reinforced concrete building for Montgomery Ward & Co., Chicago, has a monolithic concrete exterior finish

Steel-Core Concrete Columns

One of the reasons for the use of reinforced concrete in buildings of greater height than was formerly considered feasible may be found in the use of structural steel cores for the columns in the lower stories. Girders of ordinary reinforced concrete design are framed into these columns. True reinforced concrete columns are used farther up. Details governing the design of these special columns have become fairly well standardized, as shown in an illustrated article in the November (1929) issue of CONCRETE.

Testing Concrete-Encased Steel Beams

Tests of far-reaching importance, to determine the increased carrying capacity of steel beams when encased in concrete, were conducted during the latter half of 1929 at the Gary plant of the American Bridge Company. Load tests were made on six full-size floor panels of concrete-encased steel beams and reinforced concrete floor slabs, the beams in each instance having been tested before they were encased, so that a definite comparison could be made with the results obtained after the concrete was placed. The tests were conducted under the auspices of the Western Society of Engineers. While the results are not as yet available for publication, observers learned that the concrete added greatly to the strength of the beams, thereby confirming results of previous investigations conducted on a less elaborate scale.

The economic importance of the tests just mentioned is not difficult to understand. Up to the present time designers of concrete-encased structural steel buildings have given no recognition to the structural influence of the concrete, the latter being considered only as fireproofing. If, as the final outcome of the Gary tests, general practice is changed in this respect and recognition is given to the structural value of the concrete, it may be accepted as a foregone conclusion that practically all fireproofed steel buildings will have concrete as the fireproofing material. This will mean concrete-encased columns, beams and girders and reinforced concrete floor slabs in a vast number of buildings in which tile fireproofing and tile-arch floors would be employed under the present practice.

Building Codes

The outstanding building code work in 1929 was the practical completion of new city building regulations for New York and Chicago. In neither case have the new regulations actually been introduced in the city legislative body, but in both instances the drafts were virtually completed by the end of the year.

Notable Structures

Space could not be given to a complete list of notable concrete structures built or under construction during 1929. A few projects of special significance will be mentioned.

The Victory Building, a 26-story reinforced concrete building under construction during the year in Toronto, establishes a new North American height record for buildings of this structural type. In fact it is exceeded in height by only one other reinforced concrete building, the Palacio Salvo, 28 stories high, built several years ago in Montevideo, Uruguay. The Victory Building, though only 60 by 90 ft. in plan, towers to a height of 310 ft. above the sidewalk level.

Another noteworthy building, of a structural type destined to come into greater prominence as a result of the previously mentioned tests of concrete-encased steel beams, is the Merchandise Mart, located in Chicago. This building has a structural steel frame encased in concrete, and floor panels of reinforced concrete, and it utilized about 285,000 barrels of cement above the caissons, almost as much as if it had a reinforced concrete structural frame. The floor area of this huge building is 5,800,000 sq. ft., indicating cement requirements of one barrel to every 20 sq. ft. of floor area. This compares favorably with cement requirements in reinforced concrete buildings of similar occupancy.

The tallest reinforced concrete chimney in North America was built in 1929 for the International Nickel Company at Copper Cliff, Ontario. It rises to a height of 600 ft. and is 50 ft. in diameter at the base.

A reinforced concrete structure of striking appearance is the Richfield Building, in Los Angeles, completed during 1929. Two sides of the building are finished with a concrete exterior in which the special forms used produced vertical fluting, while a dark color was obtained with the use of china wood oil and mineral coloring pigment.

Among other projects of large size under construction during 1929 the Detroit and Canada Tunnel stands out prominently. This tunnel, which connects downtown Detroit with the business section of Windsor, is expected to cost $25,000,000 and will utilize about 80,000 cu. yd. of concrete.

The Oakland-Alameda Estuary subway, recently completed in the San Francisco region, is, like the Detroit and Canada Tunnel, a great engineering achievement. It required about 75,000 cu. yd. of high-class concrete.

The Connellsville extension of the Pittsburgh and West Virginia Railway, built largely in 1929, involved the construction of several large reinforced concrete bridges and a number of smaller structures, and required about 60,000 cu. yd. of concrete.

The Merchandise Mart, Chicago. This huge concrete-encased steel framed building, with a floor area of 5,800,000 sq. ft., required 285,000 barrels of cement above the caissons and 60,000 barrels in the caissons

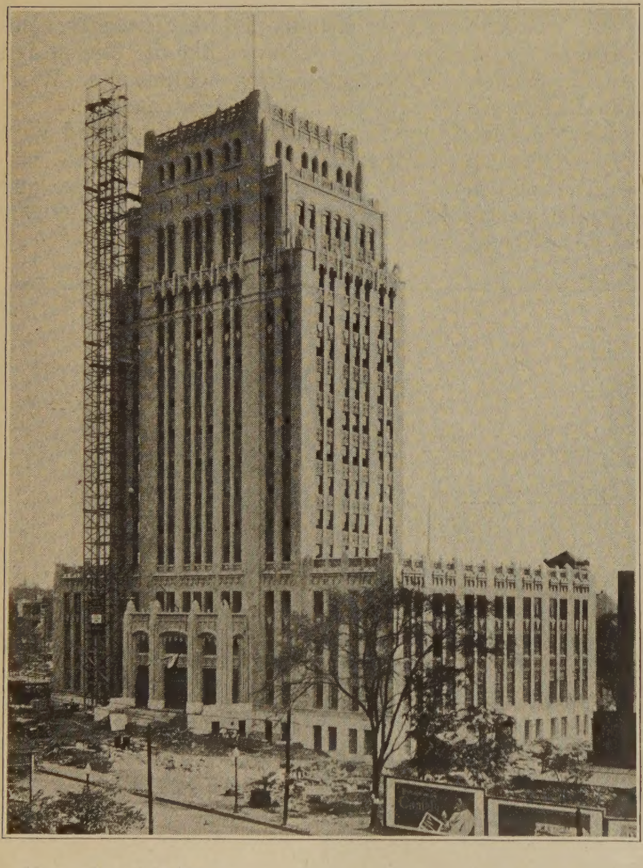
Prospects for structural concrete work in 1930 may be considered in the light of the forecasts relating to general construction prospects published in other parts of this issue. The general opinion seems to support the prediction that structural work in general, and concrete work in particular, will at least equal the corresponding figures of 1929.

Review Shows Concrete Products Invading New Fields

Inroads of Concrete Masonry in Non-Residential Construction Shown by Increased Percentage of Use During Low Construction Year—Greater Future Diversification Probable—Importance of Salesmanship Felt—Cast Stone Institute Is Aggressive—Standard Burial Vault Specifications to Be Developed

By W. D. M. ALLAN

ACCORDING to best information available building construction has declined 30 per cent since May, 1928. Building construction in 1929 averaged 14 per cent less than 1928, with residential building leading with a decline of 30 per cent. Non-residential construction increased 4 per cent. Since 80 per cent of heavy-weight and 40 per cent of light-weight block are used in residential construction, it is apparent that the available business for concrete products in the residential field was 30 per cent less than in 1928.



More than 160,000 *stone tile were used as backing for the exterior facings of terra cotta and face brick in the Atlanta City Hall, Atlanta, Ga., shown above. The structural frame is of reinforced concrete*

Non-Residential Uses on Increase

A recent survey of more than 4,000 concrete products plants, representing upwards of 90 per cent of the total volume, indicated that the decrease in concrete masonry in 1929 as compared with 1928 was less than half of the decrease in the residential building field. This means that concrete masonry must have obtained a much larger percentage of non-residential construction during the past year than ever before.

In every important market concrete masonry was sold for one or more large non-residential structures, and it is hoped that this is the beginning of a greater diversification of the use of the product. Leading manufacturers saw the danger of having such a large percentage of their products going into residence construction, carrying all their eggs in one basket, so to speak, and developed partition, fireproofing and floor filler tile, roof and floor slabs, which could be manufactured with but little additional equipment and practically no plant rearrangement. These products have served effectively in tiding over the decrease in residential construction during the past year.

The Haddon Hall Hotel in Atlantic City was the largest concrete masonry job sold. Between 500,000 and 600,000 block were used. This represents more block than the largest plant in the country produced in 1919. On

All street facades of the Telephone Building, Syracuse, New York, shown above, are faced with cast stone. It is one of the outstanding cast stone jobs in the country, being notable chiefly for its adherence to the architect's ideas one day last summer, 34,000 block were delivered to the job, and this represents more than the average annual sales per plant ten years ago.

The Problem of Overcapacity

The survey of concrete products plants also revealed the largest decrease in operating plants in any year since a record of the industry has been kept. From 1919 to 1928, the decrease in plants totaled 40 per cent. In 1929 approximately 15 per cent less plants were in operation than in 1928.

The problem of overcapacity, with which the concrete products industry has been struggling for five years, became acute in 1929. This problem is aggravated by the large overcapacity in competitive products in the common masonry field. It is estimated that the common clay brick plants could produce 25,000,000,000 units, clay tile 15,000,000,000 and concrete masonry 20,000,000,000, making a total equivalent to 60,000,000,000 brick. The largest consumption of common masonry in any one year to date was approximately 15,000,000,000, or 25 per cent of the potential capacity. Of the going business in 1929, it is estimated that common brick got approximately 47 per cent, clay tile 23 per cent and concrete masonry 30 per cent. Clay brick plants operated at about 28 per cent capacity, clay tile at 23 per cent and concrete masonry at 22 per cent.

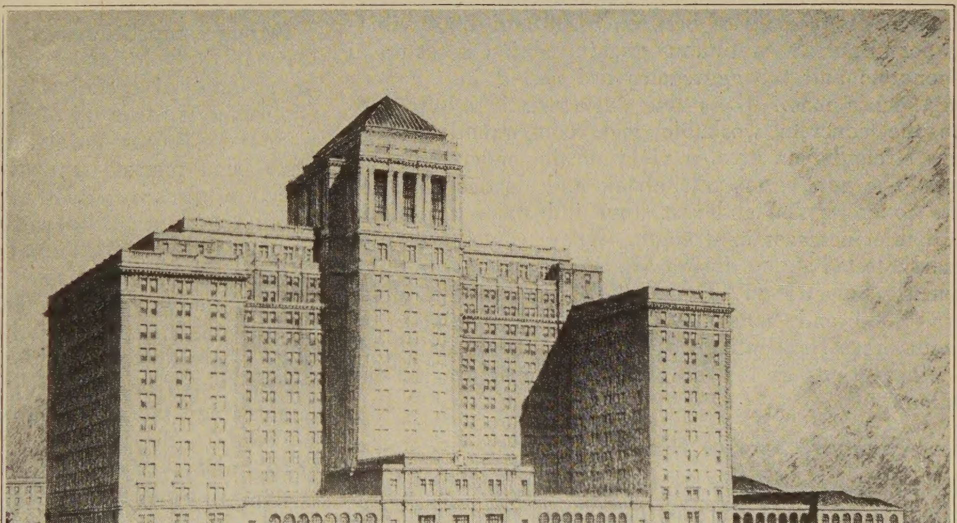
Better Salesmanship Gets Results

While the volume of concrete masonry was off in 1929, it suffered less than its principal competitors and decreased only about half as much as residential building. This showing was due largely to the increased quantity and quality of salesmanship. Nearly 100 salesmen were added to concrete products plants in 1929. The improvement in salesmanship has been even more marked than the increase in numbers. Changes in sales personnel were numerous. In one plant the salesman of a year ago is now driving the truck and the truck driver is doing the selling. In another, the former bookkeeper is running the plant and the former plant foreman is selling. Every kind of an adjustment is being made to find salesmen who "click."

For backup for the exterior limestone finish the architects of the Kalamazoo Trust and Savings Bank Building, Kalamazoo, Mich., specified haydite concrete block. Interior plaster was applied directly to the masonry walls. The structural frame is reinforced concrete. Sixty thousand haydite units were used

Light-Weight Units

Light-weight aggregates continue to lead the increase in the use of concrete masonry, especially in the non-residential field. There were no important commercial developments of new light-weight aggregates. Cinders and haydite are the leaders. In one limited market, water-



Approximately 500,000 *cinder concrete masonry units were used for backing up the exterior walls of face brick and for some partition walls in the construction of Haddon Hall, a hotel building just completed at Atlantic City, N. J. This project holds the record for number of concrete masonry units used* cooled slag has been quite widely used as a light-weight material. Laboratory investigations are under way to develop a new light-weight material by sintering household and other unsuitable cinders to make a satisfactory aggregate.

Insurance Situation Cleared Up

The insurance situation has cleared up so that with few exceptions it is no handicap. There was, however, an increased tendency to use the inspection service of the Underwriters' Laboratories because of its sales value. Nothing creates public confidence for concrete masonry as well as this service.

Improvements in plant equipment and plant efficiency suffered during the year. Because of the overcapacity and a declining market, all energies were directed toward sales activity.

Measures to Prevent Cracking

Cracking in concrete masonry walls was one of the most serious sales problems the industry faced. An extensive series of tests has just been completed at the Underwriters' Laboratories, in which it is proved that units laid in an air dry condition have no tendency to crack, even in long-span walls. In more than 75 per cent of the cases where cracks have been investigated they were directly attributable to poor construction methods and the remainder were due to using block that were too wet. The industry is fully acquainted with the importance of using dry block so that cracking from this source will rapidly disappear.

Experiments with high-pressure steam curing and with closed circuit high-temperature moist air curing indicate that block cured 18 to 24 hours have developed sufficient strength to meet building code requirements and that practically all tendency to shrink is eliminated.

The application of high-frequency vibration to the molding of various types of concrete products has made great progress during the year. Concrete block and tile machines on the West Coast have been developed and the majority of the manufacturing methods there use vibration. With frequencies of between 3,000 and 4,000 vibrations per minute, a continuous quaking action is set up in the concrete and the aggregates are nested into a very strong, dense mass. Less fine aggregate is required to make the concrete workable and, consequently, either higher strengths or greater yield of the concrete is obtained. The application of both air and electric vibrators in the concrete pipe and cast stone industries has shown remarkable increases in strength. Where concrete in pipe formerly tested 4,000 lbs. a sq. in. in compression, it frequently now tests 7,000 and 8,000 lbs. In cast stone, where 5,000 and 6,000 lbs. used to be obtained, the strengths have frequently been raised to 18,000 or 20,000 lbs. Absorptions as low as 1 to 2 per cent are not uncommon.

House Plans by Service Bureau

Eighteen house plans were prepared by the Architects' Small House Service Bureau featuring houses built with concrete masonry walls, portland cement stucco, reinforced concrete first floors and fire resistant roof coverings, such as concrete roofing tile or cement-asbestos shingles. These plans were published in about 80 newspapers, reaching upwards of 4,000,000 readers weekly.

Lighting Standards

Increased confidence on the part of city officials in concrete lighting standards has been responsible for a very satisfactory growth in this field. The better placement of reinforcement and methods of manufacture, such as vibration and the use of the centrifugal process for more thoroughly compacting the concrete, have reduced the amount of water required and eliminated the principal tendency toward shrinkage. Improved curing methods have made the quality of the concrete better so that cracking in the products of leading manufacturers is practically unknown.

Drain Tile

With the exception of southern Minnesota and sections of Wisconsin and Iowa, the drain tile business remained at a low ebb, with some indication of increased activity due to the better financial condition of farmers.

Cast Stone Institute

The Cast Stone Institute has made more progress in 1929 than any other branch of the concrete products industry. It has carried on an advertising campaign in architectural magazines to acquaint architects with the tentative standard specifications for cast stone and with methods of specifying the material according to surface finish. Color and texture, two inherent advantages of cast stone, have been presented to architects in an effective manner. The Cast Stone Institute has installed equipment for preparing test specimens and has carried on an educational campaign with its members and others who wish to co-operate to improve the quality of cast stone and to assure architects that the products they buy meet the specification. This calls for a minimum of 5,000 lbs. per sq. in. in compression and an absorption of not less than 3 nor more than 7 per cent when the product is tested as 2-inch cubes or 2 by 2-inch cylinders. It has also prepared a very attractive booklet on cast stone which will be distributed to architects, bankers and others who are interested in the product. This booklet tells the complete story of the quality of cast stone and its decorative possibilities.

Burial Vault Specifications

Strong competition in the concrete burial vault field led a group of Ohio burial vault manufacturers to start work on a standard specification regulating the quality. The committee is made up of high grade men and has the support of leading manufacturers throughout the state. There have been marked improvements in the quality of the concrete already. The application of vibration to the manufacture of burial vaults has been a great aid in improving quality; 3,000 and 4,000-lb. concrete can be produced by vibration, where in former times strengths frequently ran as low as 1,000 to 1,200 lbs. when ordinary spading methods were used on very sloppy concrete. It is quite likely that the work started by the Ohio vault manufacturers will be picked up by manufacturers all over the country and the specifications they develop will doubtless be used as the basis for a standard specification to be prepared by some technical organization.

Almost without exception the concrete products industry faces 1930 with confidence, due to the fact that it increased its percentage of the available business in a declining market in 1929.

Northwest Products Meet

Members of the Northwest Concrete Products Association were scheduled to hold their fourth annual convention on January 24th and 25th, at Seattle, Washington.

How to Save in Concrete Form Work

The Second of a Series of Articles on Form Work Economy and Details—Spacing Yokes for Column Forms of Different Sizes and Shapes—Construction and Assembly of Wooden Column Forms

II—Forms for Interior Columns

By A. B. MacMILLAN
Chief Engineer, The Aberthaw Company, Boston, Mass.

COLUMN forms are subjected to great pressure from fresh concrete, for the reason that, as a general thing, all the concrete in a column is placed before any of it has attained its initial set. In consequence, the base of a column form is under a pressure head of nearly a story-height. Often the pressure is still further increased because of the practice of hammering the column forms to "settle" the concrete.

The pressure on column forms is resisted by variously detailed yokes which are clamped on the form boards and hold them in a tight grip. The yokes are spaced much closer at the bottom of a column than at the top. In our practice we space the two uppermost yokes 24 in. apart. The next one below is spaced at 20 in.; three more are spaced 18 in. each; the next three at 15 in.; the next three are spaced at 12 in., and three more at 10 in., provided the column is long enough to require so many.

The spacing of yokes for column forms, whether for square, round or octagonal columns, is shown in Figure 9. To determine the spacing for a column of any given height, consider the length of the column as being measured from the top in Figure 9. Thus a column 10 ft. high will require 7 yokes, spaced at 24, 20, 18, 18, 18 and 15 in., starting with the top.

The form boards for small columns may be ⅞-in. tongue-and-grooved material, but for larger columns heavier boards or planks of square-edged material are commonly used for square, rectangular or octagonal columns. Forms for round columns may be of wood lagging or of metal. Metal forms will not be considered here, for the reason that they will ordinarily be detailed, erected and stripped on a fixed price basis by the fabricating shop that manufactures them.

Length of Column Form

The length of a column form for an interior column will be the same on all sides, the total length being the story height, less the thickness of the concrete floor slab and the thickness of the floor slab forms at the column forms.

Details showing the notching out at the top of column forms to fit the forms for beams or girders framing into the columns will be given in a future article in this series.

Figure 10 shows a simple yoke for a square column of moderate size, made of 2-by-4 clips and cleats. The advantages of this type are that no tie bolts are required, and that the forms may be adjusted for use with smaller columns.

To illustrate more completely the use of the same yokes in columns of different sizes, assume that the smaller column for which the forms are again to be used has sides 2 in. less than the column to which the left half of Figure 10 applies. This means that each of the four form strips marked *S* in Figure 10 must be 2 in. wide, or just wide enough to make up the difference in column sizes. Then when the forms are to be used for the smaller column shown in the right half of Figure 10, the four strips just mentioned are removed, and additional blocks, marked (*b*), are spiked inside and against the block (*a*) at one end of each clip and each cleat. The blocks (*b*), like the strips *S*, must be just wide enough to make up the difference in column sizes. The form is then reassembled for the smaller column, as shown in the right half of Figure 10.

In making up the forms shown in Figure 10, the boards on two opposite sides (the right and left sides in the figure) are nailed to the cleats, which serve as battens. The

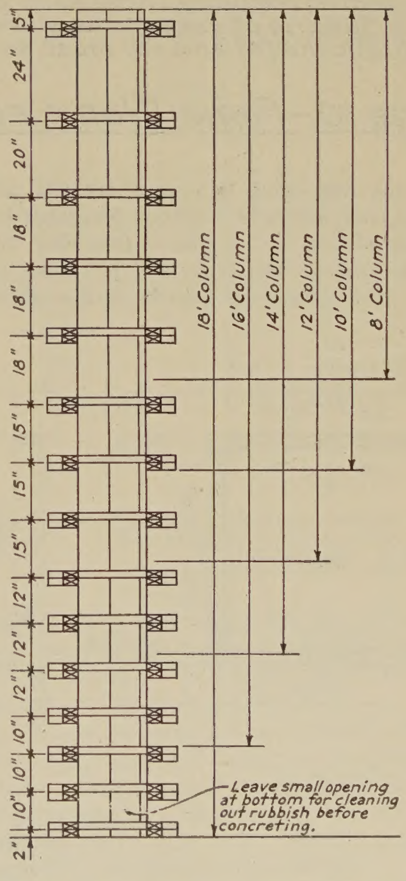
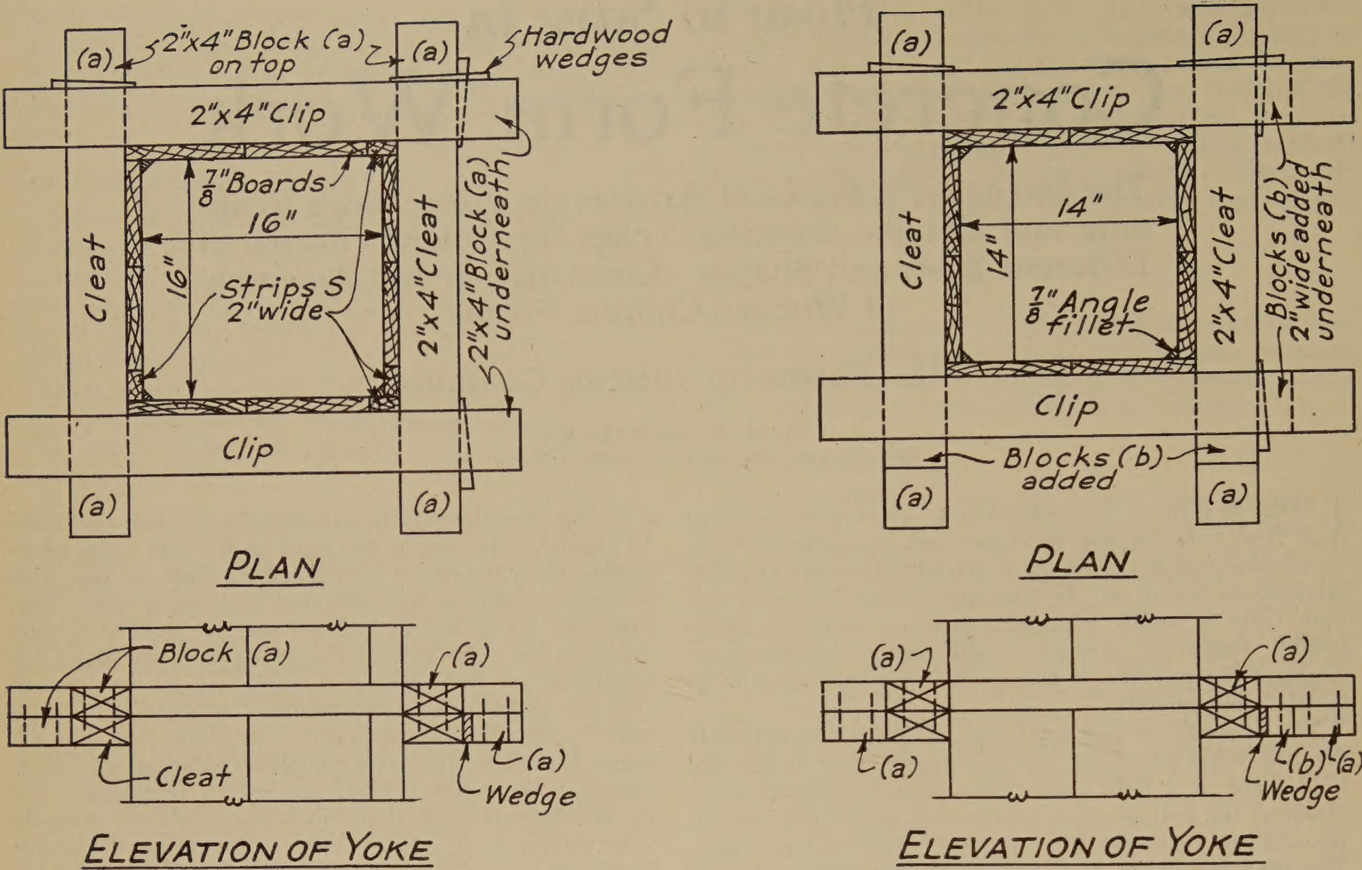


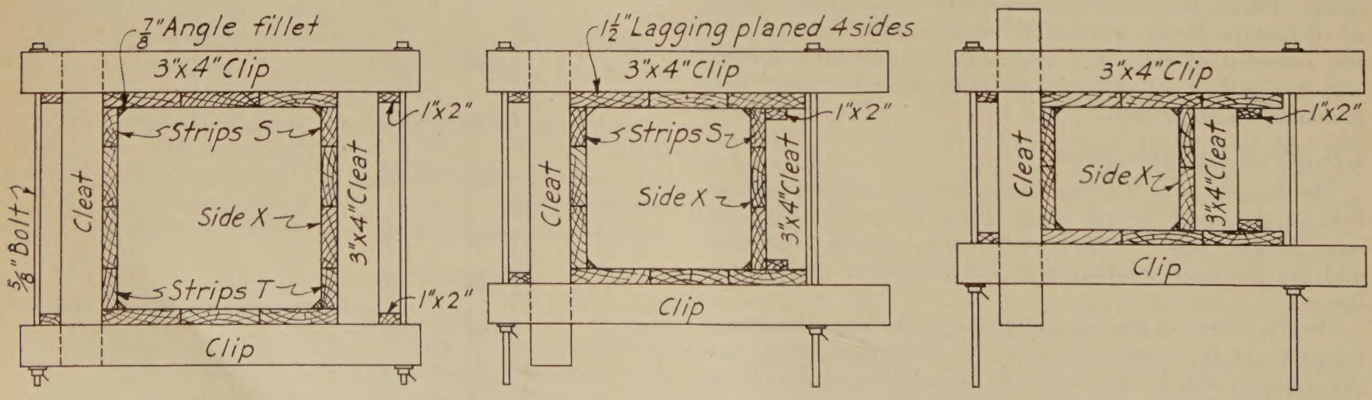
FIGURE 9 - SPACING OF YOKES FOR COLUMN FORMS



Notes:-
(1) Same yoke and form boards are used for smaller columns by removing strips "S" and adding one block (b) to each cleat.
(2) Spacing of yokes is as shown in FIGURE 9.
(3) Blocks (a) and (b) must be securely spiked.

FIGURE 10 - FORM WORK FOR SQUARE COLUMNS OF MODERATE SIZE

boards on the remaining two sides are not nailed to the 2-by-4 clips, but are held together temporarily by a few light battens of 2-by-3's so placed that they do not interfere with the yokes. The right and left sides are then set into place, after which the boards of the other two sides are set against them and the 2-by-4 clips are placed over the cleats in saddle fashion. The blocks on the clips and cleats prevent each other from spreading. Final tightening up of the yokes is made with hardwood wedges. The blocks (*a*) and (*b*) must be securely spiked, for the



ORIGINAL

1ST REDUCTION
Strips "T" removed, side "X" moved in, 3"x4" cleat cut down and 1"x2" set in as shown behind boarding.

2ND REDUCTION
Strips "S" and "T" removed, side "X" moved in, 3"x4" cleat cut down and 1"x2" nailed behind cleats.

Note:- Spacing of yokes is as shown in FIGURE 9

FIGURE 11 - FORM WORK FOR SQUARE COLUMNS OF LARGE SIZE

security of the column form depends on their holding power.

For rectangular interior columns the same method is followed as in the form work for square interior columns detailed in Figure 10.

Square or Rectangular Columns of Large Size

Figure 11 contains details for square or rectangular columns of large size. While the details are self-explanatory and the principle is the same as with the smaller column in Figure 10, certain differences should be kept in mind.

For instance, the form material is heavier. The form boards are 1½-in. square-edged material instead of ⅞-in. Cleats and clips are longer and will have holes drilled in them, and for these reasons 3-by-4's are needed instead of 2-by-4's. Tie bolts are used in one direction, and blocks in the other, instead of depending on blocks alone.

The spacing between yokes, however, will be the usual spacing shown in Figure 9. Observe also that the method employed in reducing the column size in Figure 11 is similar to the method illustrated in Figure 10. That is, the removal of narrow strips of form boards in the original column form brings about a reduction to the next smaller column size.

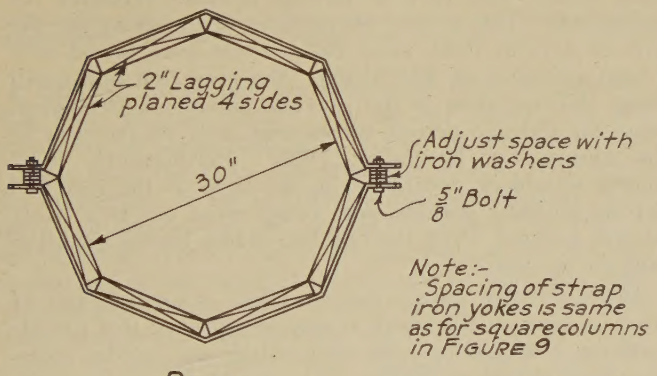
Fillets in Corners

It is customary to place fillets or cove moldings into the corners of column forms, to obtain beveled or rounded corners. Figures 10 and 11 show fillets in place for this purpose.

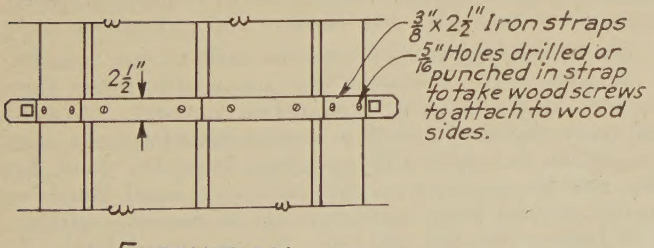
Octagonal Columns

When dealing with octagonal columns we space the yokes in accordance with Figure 9, but instead of using wooden 2-by-4's or 3-by-4's we employ ⅜-in. by 2½-in. iron straps, as illustrated in Figure 12.

As the detail shows, each strap is in two sections, and each section has eight 5/16-in. holes for the wood screws that fasten the straps to the form boards. The boards are of 2-in. stock, dressed on all sides to a thickness of about 1⅝ in. It is not necessary to go to the additional expense of beveling the edges of the form boards, inasmuch as the tightening of the iron straps makes the form mortar-tight even though the boards are in contact only at the inner edges.


2" Lagging planed 4 sides
30"
Adjust space with iron washers
⅝" Bolt
Note:- Spacing of strap iron yokes is same as for square columns in FIGURE 9

PLAN


2½"
⅜"x2½" Iron straps
5/16" Holes drilled or punched in strap to take wood screws to attach to wood sides.

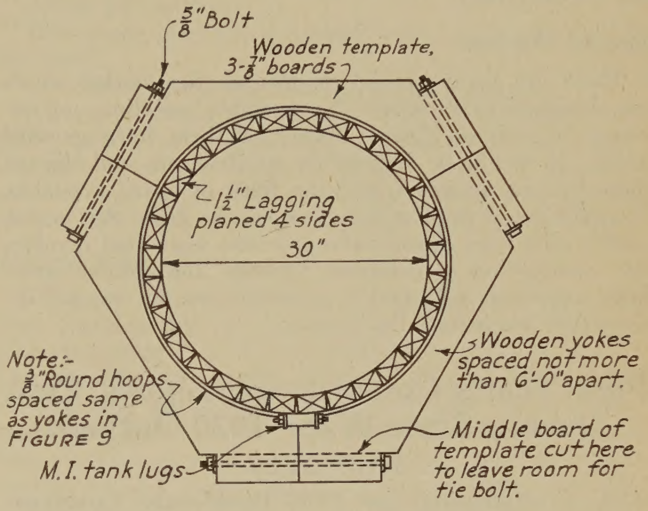
ELEVATION

FIGURE 12 - FORM WORK FOR OCTAGONAL COLUMN

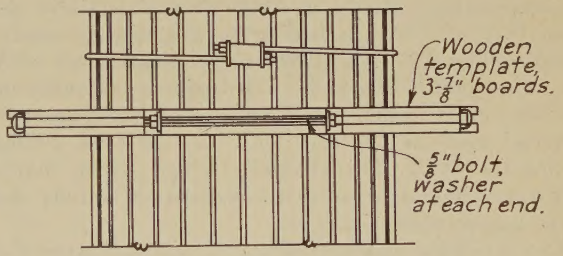
The column form is assembled in halves by screwing strap halves to four of the form boards, this work being done on the floor. The halves are then raised into position and secured by short ⅝-in. bolts, the necessary adjustments being made by iron washers.

Circular Columns

We often use steel forms for circular columns; but for the reason previously stated, steel forms will not be considered here.


⅝" Bolt
Wooden template, 3-⅞" boards
1½" Lagging planed 4 sides
30"
Wooden yokes spaced not more than 6'-0" apart.
Note:- ⅜" Round hoops spaced same as yokes in FIGURE 9
M.I. tank lugs
Middle board of template cut here to leave room for tie bolt.

PLAN



ELEVATION

FIGURE 13 - FORM WORK FOR CIRCULAR COLUMN

For wooden form boards on circular columns we use 1½-in. lagging, planed on all sides, and hold them in place with a combination of wooden yokes and round steel hoops. Details are given in Figure 13.

The steel hoops are spaced in accordance with Figure 9. The wooden yokes are few in number, one being placed at the top of the column, one at the bottom, and a sufficient number at intermediate points to keep the vertical spacing of yokes at not more than 6 ft. Usually either three or four yokes will be needed on each column.

The construction of the wooden yokes requires some mill work, and the exercise of considerable care in assembling. The circular segments, when once cut to a certain radius, can not be adjusted to any other column size.

A yoke, as detailed in Figure 13, is made in three parts, each part being built up of three ⅞-in. boards, or templates, cut as shown. The middle of the three boards is cut off at each end, as indicated in the figure by the dotted line parallel to the tie bolts. This detail permits insertion of the tie bolts, which have washers at each end to grip the two outer boards of the template.

Template Boards

The width of boards for the template, as well as the length of tie bolts, can be determined most readily by laying out to a definite scale the principal lines of a diagram similar to the plan in Figure 13. The figure indicates that, for a 30-in. column, 12-in. boards will be required for the templates, and the tie-bolts will be 20 in. long. This layout, however, will be made by the mill that cuts out the templates.

Special Devices

There are many special devices on the market which are designed to facilitate the assembly, erection and removal of column forms. Many of them have genuine merit. It would be impossible to illustrate and discuss these various devices within the limit of space available. Nevertheless, a general statement can be made that a contractor who does considerable concrete work that involves the construction of columns, pilasters and similar structural members, will find it profitable to use special devices that are in fact time-savers.

Past Year's Construction Shows First Decline Since War—1930 Outlook Improves

A. G. C. Optimistic for 1930 Residential Construction; Some Estimates and Figures by Other Agencies; Department of Commerce Predicts New Construction Record

Construction activity in 1929 showed a slight decline from that of 1928, according to a statistical study just completed by the Associated General Contractors of America. The total volume of construction performed during the year as indicated by shipments of basic construction material was one per cent less than the total volume on record for 1928. This decline, though slight, marks the first year since the war that construction activity did not show a progressive increase.

The activities of the National Business Survey Conference, organized at the instance of President Hoover to stimulate construction and other business activity, have not yet had any effect on the statistical picture of the industry, according to the contractors' data.

Contract awards have shown no statistical evidence of recovery to normal volume although it is reported that plans in progress, which should eventuate in future contracts, are above normal, especially in the public works construction field. The total volume of contracts awarded in the 37 eastern states reported on by the F. W. Dodge Corporation amounted to $5,613,606,600 during the first 50 weeks of 1929. During the same period in 1928 the awards were $6,395,524,900.

The decline in contract awards was largely in residential type construction during 1929. The outlook for 1930 is thought to be improved as regards this class of building. Evidence of this is indicated in the analysis of recent contract awards which show an increase in number by 1,731 compared with the previous week. The total floor space and valuation awarded was less, however, indicating that smaller projects are being let in greater volume.

The new construction division of the United States Department of Commerce, headed by Dr. John M. Gries, predicts a record figure of nearly $7,000,000,000 as the value of new construction and maintenance during 1930 by public utilities and the public works departments. In the opinion of Dr. Gries, the designated expenditures for these types of construction are in excess of all previous records during times of peace.

Public utilities, he predicts, will also spend large sums for the maintenance of existing plants and equipment. The estimate of seven billion dollars does not include residences, commercial or industrial structures or other private work which last year amounted to more than three billion dollars.

Construction contracts awarded in the first 17 days of 1930 amounted to $209,690,800 in the 37 states east of the Rocky Mountains, according to reports received and tabulated by the F. W. Dodge Corporation. The nearest comparison with the corresponding period a year ago is found in the same organization's reports for the first 18 days of 1929. After deducting one-eighteenth of that amount, to get the comparison on a 17-day basis, the contracts awarded for the first 17 days of 1929 totaled $213,952,000.

That is a surprisingly good start for 1930, especially when it is considered that the revival in private building construction is likely to be delayed several months. It indicates that the railways and other public utilities, the public works departments and others who promised or predicted increased construction during 1930 are making good on their promises.

Even private building construction may have begun its revival, if the building permit values recorded by the bureau of building inspection of the City of Chicago are any indication. In the first 22 days of 1930 the department issued 100 permits having a total valuation of $4,966,900. This is only 50 per cent of the value for the first 22 days in 1929, when 282 permits were issued with a total valuation of $9,879,500. But even that is a much better showing than in the previous month of December, when the Chicago permit values were only 23 per cent of the figures for December, 1928. Furthermore, these figures should be considered in the light of the fact that private building permits were being taken out at a lively pace in January, 1929, the building slump having occurred later in the year.

If the Chicago figures may be taken as an indicator of what is going on elsewhere, it may be expected that private building construction will soon climb up on the corresponding record of 1929. This would be in line with conclusions previously reached, based on a study of statements of business leaders, discussions at commercial meetings, and private talks with bankers and contractors.

The advice of several prominent bankers, for instance, is to prepare for a normal year, or a little better than normal, in the concrete construction industry. A well-informed official of a western cement manufacturing company states that their 1930 prospects look very good, but that they do not expect a definite revival until March or April. Several large contractors are of the same opinion. The January Monthly Building Survey issued by S. W. Straus & Company predicts a definite turn for the better in private building operations by mid-year or earlier.

The actual results thus far reported for part of the month of January can be interpreted only as a tentative confirmation of the foregoing predictions.

"Volumitis" and the Concrete Products Industry

Two Products Men Get Together and Discuss the Fundamentals of the Present Concrete Products Situation—Approve of Right Kind of "Volumitis"—Would Cut Number of Plants in Half

By T. H. MERRIAM

> "The picture of the concrete products business in Milwaukee County six months ago . . . is one that can be duplicated today in twenty other large concrete products manufacturing centers in the United States. Modern merchandising methods and an attack of 'volumitis' had developed to such an extent that in the struggle for business—in the endeavor to keep every plant running to peak capacity—all thought of sales based on a reasonable profit had faded out of the picture. 'Get the business'—that seemed to be the thought of most of the manufacturers. Nine to twelve concrete products salesmen were 'hitting' every job. Naturally, in the anxiety to get a large volume of business, prices were being constantly hammered down—with sales expense constantly mounting. . . ."
>
> —From "Is This the Way Out?" by "Spec" Collins, published in CONCRETE for November, 1929.

ALMOST every day products men from various sections of the country call at our office. On this particular occasion, two had arrived at the same time. Fred is from the East—Joe from the Middle West. Both are well-known in the industry as experienced plant managers and owners who are among the most progressive in the business. They both follow the trend of the industry closely and devote considerable thought to increasing their business and their profits. The discussion that took place between these two men brought out so many of the fundamentals of the concrete products situation that I have tried to set down what was said exactly as it took place.

Fred was reading aloud the paragraph quoted above to Joe and myself. As he finished, he smacked his fist down on the desk and said:

"That's exactly right. The whole trouble with the concrete products business is 'volumitis.' "

"I agree with you except on one thing," said Joe. "You assume that the industry has 'volumitis.' I claim that it needs real 'volumitis'—of a particular kind that only a few plants that are outstandingly successful have."

"What do you mean we need 'volumitis'?" Fred shot at Joe. "What that article says is absolutely straight. There's too much of it now."

"Wait a minute," said Joe. "Let's get into this a little deeper." He drew a pencil and pad toward him. "Merriam, how many concrete masonry units were produced last year? Convert it all into 8 by 8 by 16-inch block. How many block would that be?"

"About 387 million."

"How many clay tile and brick were made and sold?" Joe asked.

"Converting it all into block, over 875 million."

"All right. Let's add that together. That makes the whole market for common masonry materials over a billion and a quarter ordinary block. And yet concrete masonry only got a little more than one-fourth of that market," Joe said, pushing the tablet over to his friend.

Internal Struggle

"I'll agree with you on that," Fred replied. "Just because building fell off a little this year doesn't need to mean that there's any less market for concrete masonry. It means that the concrete products salesmen have got to sell just that much harder to get a bigger share of the market that now goes to other materials. But here's the thing that gripes me. Instead of going after the nine hundred million market that now goes to other stuff, the products men are fighting among themselves for the four hundred million market. That's why I claim that 'volumitis' is the trouble with us all. We're trying to keep running at the peak and we're making more block than we can sell. So we have price wars and mess everything up and none of us makes any money."

"There's where you are wrong, Fred," Joe said. "You say we are trying to keep running at the peak. Do you know the peak capacity of the products plants in this country?"

"No."

"There are 4,500 concrete products plants," Joe told him. "The actual capacity of those plants is almost two billion block. That is five times the actual number of concrete units made and sold. There is plant capacity for more concrete block than the whole market for masonry materials of all types is today."

"Gosh, Joe, that's something to think about," Fred said. "But what are we going to do about it and how about that remark of yours that we need more 'volumitis'?"

"Here's what I mean," Joe said. "You brought out the first point in what you said a little while ago—we need 'volumitis' sales. With only one-fourth of the market going to concrete units, it takes real volume sales to get a larger per cent of that business for concrete masonry.

"That's one kind of 'volumitis' we need. But there is another kind that I had in mind. Two thousand efficiently operated concrete products plants could do the work that is done by 4,500 plants that are in business today. Furthermore, those 2,000 plants can take care of the expansion of the concrete masonry market that will result from volume sales. That means that there are 2,500 more plants in the industry than are needed," Joe stated, bluntly.

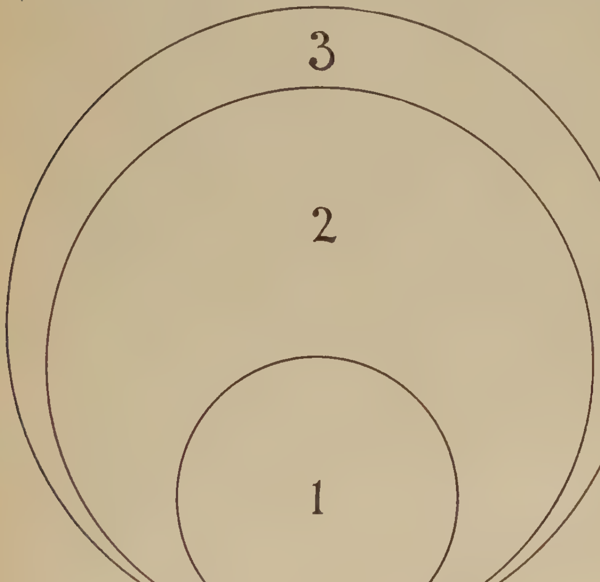
Doubled Overhead

"That's where your profits are going," he added. "It means that there are 4,500 bookkeepers, 4,500 credit systems, 4,500 office girls, 4,500 sets of books and typewriters and telephones, 4,500 superintendents, 4,500 completely equipped plants that are paying 4,500 minimum fixed costs on their investments every year.

"Instead of 4,500 of each of these sources of expense, there should be only 2,000. There is a certain basic cost per unit for materials, labor and operating expenses. The overhead cost that is involved in those items that I mentioned before could just as well be spread over twice the number of units per plant that those 4,500 plants are now producing. If you cut out the 2,500 extra plants that are in business today and spread the overhead cost of the remaining 2,000 plants over the 387 million concrete units that are produced, the cost of manufacturing is materially reduced. With less than half the plants selling more than the present total number of concrete units, the sales expense would also be reduced.

"Two things would result," Joe pointed out. "In the first place, the market price of the units could be lowered, which would help in the competition with other materials. In the second place, the profits per unit would be increased.

"The concrete products industry is carrying 2,500 lame ducks," Joe continued. "It's just as though you went up into Ontario or some other far-away place to build a big dam or other project. You hire 4,500 men, buy tools for them, build bunk-houses, and take up cooking equipment and cooks to feed them. When you get up there, you find that there is only room for 2,000 to work even when you run double shifts. You've got all this money tied up in tools and equipment. But the extra 2,500 men have nothing to do and are an expense. That's exactly what's taking place in the concrete products industry, with 2,500 lame ducks dragging along.



Circle No. 1 represents the 387 million concrete masonry units produced and sold by the 4,500 concrete products plants of the country

Circle No. 2 represents the entire market for all types of common masonry materials, equal to one and a half billion 8x8x16-inch units

Circle No. 3 represents the actual capacity of the 4,500 products plants which is more than the entire masonry market for all materials

"The kind of 'volumitis' that we need," Joe said, "Is for plants that are adequately financed and efficiently managed to go into real volume production and volume sales. While their profit per unit may be smaller, their total net profit will be larger. And we're all in business to make a profit."

"Joe, you said a mouthful," Fred said, thoughtfully. "I can see where you are right. But, meanwhile, here are these 4,500 plants in business. What are we going to do about the 2,500 lame ducks?"

"There is just one answer," Joe said. "The highbrow would say that the process is an economic elimination of the economically unfit. I would say that those fellows that can't get their production on an efficient basis and reduce their manufacturing costs by volume production and volume sales will be at the mercy of the plants that can do those things.

"One way out of the present situation is consolidation. Where there are 26 plants serving an important building center when the work could be done by five efficiently operated plants, a consolidation would save the fellow who is at present inefficient. The other way out is bankruptcy.

Business Now in Expansion Stage

"The concrete products business is just like every other industry in this country," Joe continued. "It has gone through a development stage in which a few original plants had things pretty much their own way and made nice profits. Then, it went into the state we are in now—a period of expanding markets—in which too many manufacturers got into the business. Now we are moving towards the third stage—a period of stabilized business with efficiently operated plants that meet increasing market demands. The automobile business went through it. The hollow clay tile business went through it and the number of tile plants was reduced from more than a thousand to 256 that are running this year. Just think, Fred, in 1920 there were 7,000 concrete products plants. Today there are 4,500 that are doing 700 per cent more business than those 7,000 plants did. In a few years there will be only 2,000 concrete products plants and they will be doing a bigger business than we can even dream of today. The transition is always severe in every business. Price wars and bankruptcy are both parts of it. But, write this down in your book, Fred, the plant that survives and increases its business and its profits is the plant that is efficiently operated to get volume production and that disposes of its volume productions by aggressive sales."

Reinforcing Makers Prepare for Annual Meeting

The sixth annual meeting of the Concrete Reinforcing Steel Institute will be held at the Bon-Air Vanderbilt Hotel at Augusta, Georgia, beginning Monday, March 31, and concluding Wednesday, April 2nd.

The program, as tentatively planned, will open with a meeting of the board of directors on the 31st, regional conferences will be held in the afternoon, and the opening session of the institute will be held in the evening.

There will be but one, a morning session, on April 1st, the balance of the day being devoted to diversion. The third day, however, will open with a morning session, followed by a luncheon meeting of the board of directors, regional conferences in the afternoon, and a meeting of the forms department in the evening.

~ EDITORIAL ~

Concrete Masonry Units in Modern Skyscrapers

THERE was a time when concrete masonry units were used almost exclusively in small buildings. That condition no longer prevails, for today the industry is represented by a diversity of products intended for a diversity of uses.

The original 8 by 8 by 16 inch wall block continues to be used in large volume; but products manufacturers now make many smaller building units for fireproof partitions, for column and girder fireproofing, for back-up block, for combination tile and joist floors, and for a variety of special uses.

This constantly increasing tendency to enter new fields has been a fortunate thing for the products industry, for it has served to maintain a fairly good demand in the face of last year's decline in the volume of new building construction.

It has also created a favorable change in the attitude toward concrete products on the part of financing organizations and fire insurance underwriters.

Those who have not been in close touch with the concrete products industry will be amazed to see concrete partition block and column and girder fireproofing units in modern 20-story skyscrapers. Those who are close to the industry see this as the logical result of many years of sound promotional effort.

Concrete Base for Brick Pavements

SEVERAL papers read before the recent annual meeting of the National Association of Paving Brick Manufacturers stressed the importance of a strong concrete base under brick pavements, and cited specific cases in Pennsylvania where both the thickness and the quality of the concrete base were much above the ordinary.

In Illinois the specifications of the state highway department require the thickness of a concrete base under a brick pavement to be of the same quality and practically the same thickness as for a concrete pavement in the same location. That is, in a location requiring a 1:2:3½ concrete pavement 9 inches thick at the sides and 6 inches at the center, a 1:2:3½ concrete base for a brick pavement would be 9 inches thick at the sides and 5½ inches at the center.

The Bates road test, in Illinois, long ago demonstrated that the load-bearing capacity of any pavement depends upon the strength of the base, and that the thickness and quality of a concrete base should be very nearly equal to that of a concrete pavement in the same location.

It is encouraging to know that recognition is being given to these facts by an organization outside the cement industry.

Hats Off to Cast Stone

HATS off to cast stone and the Cast Stone Institute. In the face of the declining volume of new building construction last year, and in spite of other discouragements, this industry, acting through the Institute, has a long list of worthy accomplishments to its credit.

Prominent among these achievements is the Institute's adoption of a tentative standard specification for cast stone. Another is the preparation of a recommended standard practice covering the use of cast stone. A third achievement is the setting up of a testing service for the use of members and nonmembers who wish to improve the quality of their product. Finally, who has not admired the high character of the nation-wide advertising campaign conducted by the Institute for the purpose of acquainting architects with cast stone?

This creditable record has, moreover, been made in a little more than two years of existence as an organized body.

Without in any way detracting from the recognition earned by the people back of these accomplishments, the record of the Cast Stone Institute is an outstanding example of the value of group organization.

Attend Your Convention

WE are in the midst of the convention season. Some of these annual affairs are past history and others are soon to come. If the date of your convention is still ahead of us, do not deceive yourself with the thought that you can't afford the trip. The truth is you can't afford to stay home.

No matter how small his annual business may be, the contractor, the products manufacturer, the architect and all the rest, owe themselves the mental stimulant obtained from this annual trip away from the daily grind, the social contact with men in the same line in other sections of the country, and the chance to discuss their own problems with the other fellows.

Forget the cost of the trip, and don't fail to attend your convention.

From the Products Associations' Bulletins

Iowa Concrete Products Association

R. L. GAVIN, Secretary-Treasurer

The item of greatest importance in the January issue of the "Concrete Products News" of this association is the announcement that the annual meeting will be held at Des Moines, February 19th and 20th. By thus holding the state meeting after the national products convention it is expected that a speaker who has attended the larger convention will be secured to give detailed information on the accomplishments of the national organization for 1929 and the program outlined for 1930.

In order to swell the attendance, "a suggestion has been offered that each member personally invite and bring another manufacturer to the meeting. The suggestion is a mighty good one, so you call that products man near you on the phone and tell him you are going to bring him in to a meeting that no products manufacturer can afford to miss."

Another announcement of interest is addressed particularly to burial vault men, as follows: "An expert on merchandising has been secured to tell you something about the proper kind of publicity needed in selling concrete vaults. A complete discussion will follow his talk and everyone will be at liberty to ask questions or discuss any phase of their business they choose.

"Watch your building code," the News admonishes. "Investigate carefully any proposed changes in your codes and write your secretary at once when changes are contemplated. A competent engineer will be sent to review the situation and make proper recommendations for concrete masonry. Neglect this important part of your business and your competitors will have you walking around in a barrel in no time. Check your building officials carefully when code revision is mentioned."

Wisconsin Concrete Products Association

JACK FRANKLIN, Secretary-Treasurer

"The Beaver Had to—So Do You!" is the title of the lead item in the November-December issue of the Wisconsin "Digest." It continues, "Remember the story of the beaver that climbed the tree because the dogs were after him? He never thought he could do it before, but when he had to in order to save his life he found a way.

"In this era of modern merchandising it is almost necessary to do the impossible in order to hold business and get new business. That is—what seemed the impossible three years ago. It wasn't much longer ago than 1925 when most products business came to the plants. 'Them days is gone forever.' The man who keeps his plant running to capacity these days is the fellow who packs a mighty sales wallop and goes after the business with bang-up confidence. He does the seemingly impossible."

"No matter who you're talking to," says the Digest, "whether it be owner, architect, general contractor or mason, you've got to sell ideas. Get away from the thought that you're merely selling a product.

"You're selling something that people need, want and must have. And when the old price argument comes up, it's time for you to put across the idea that you're selling more than just a product—you're selling real value, economy—you're making it easier for the man using your product to get more jobs, making it easier for him to satisfy his customers. Not only will this make money for him, but the ultimate owners of the place will likewise be gainers."

Another item covers the subject of recurring slack periods, and the products man is advised that "if home and basement construction is off the thing to do is to develop the use of your product in larger buildings. In Milwaukee, over 75 per cent of the store and apartment buildings now have 16-in. foundations built of concrete block. This is a development made necessary by the falling off of home construction.

"So the thing to do is to keep plugging, to keep on hitting the line, keep planning and devising new uses for products. You can't take advantage of the lift of a wave unless you've been swimming hard between rollers."

Secretary Franklin tells of a situation he ran across on a trip through the state. He says, "The local products manufacturer was asking for the help of the association in landing some special work, and yet the local man had been 'riding along and dragging his feet.' Within the past year he had furnished 50,000 block on one job, and 60,000 block on another, but for some unknown reason he acted as if he wanted it kept a secret.

"No photographs were taken of the jobs at any stage, no local publicity was used in any of the daily newspapers, although it could have been done without any cost, and no mention was made of these jobs to any of their customers. And the users of the blocks on these two jobs were nationally known manufacturing concerns.

"When you have a good sized job, take pictures of the job, during construction and after completion. Let your local newspaper know that you furnished the job, and that you are in position to furnish additional jobs of any size. Make the most of the job, and get all the publicity you can," he concludes.

Another item, entitled "The Big Boss" says, "Many manufacturers feel that for satisfactory results, they must be on the job all the time and assume full charge of all the details, not taking any chances on any of the employees having brains enough to do anything but what they are told to do.

"Undoubtedly, there are at least one or two men in your plant that have the ability to develop, and with a little of your help, can relieve you of much of the small detail work that comes up in connection with manufacturing and selling your products.

"Pick out one or two men in your plant, get them pamphlets on the manufacture of concrete products, take them to one of the concrete schools held each year in your district, bring them into the convention meetings. They will surprise you in their ability to grasp this information, and it will not be long before you can forget all about the minor details, and devote your full time to the more important matters."

Railway Uses Central Mixing Plant on 17-Mile Project

Trucks Distribute 60,000 Cubic Yards of Concrete on Connellsville Extension of Pittsburgh & West Virginia Railway—Maximum Haul is 45 Minutes

By F. L. RIDDLE
Engineer of Construction, Pittsburgh & West Virginia Railway Co., Pittsburgh

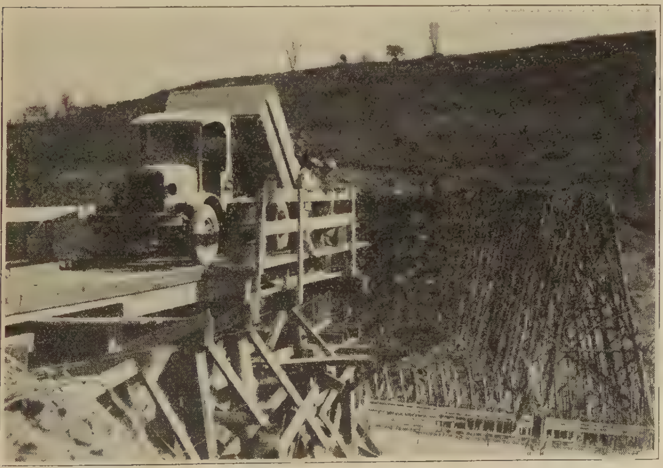
RAILWAY construction departments have for some years made use of central concrete mixing plants on single structures of great length. Notable among such instances is the tunnel for the Missouri Pacific Railway, now under construction west of St. Louis, Missouri, for which the concrete is made at a point near one end of the tunnel.

The Connellsville Extension of the Pittsburgh & West Virginia Railway is probably the first new-line railway construction project on which centrally mixed concrete has been used exclusively.

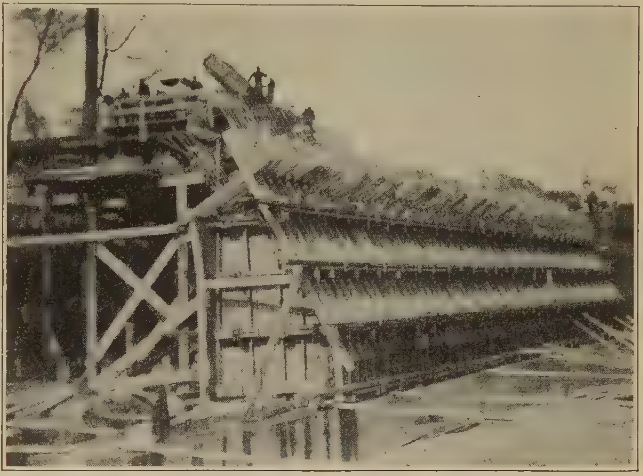
The Connellsville Extension lies between Cochran's Mill, south of Pittsburgh, and Connellsville, Pa. It connects the West Side Belt division of the Pittsburgh & West Virginia Railway with the Western Maryland Railway and is 38 miles long. There will be in the neighborhood of 60,000 cu. yds. of concrete used in the construction of bridges and tunnel lining, the major structures consisting of one crossing of the Monongahela River and two crossings of the Youghiogheny River.

During the summer of 1929 a stretch of 17½ miles of this line was under construction. The Vang Construction Company was general contractor for grading and concrete work. The concrete was placed under the water-cement ratio specification. Three classes of concrete were placed. The classification was controlled by cylinders broken at 7 and 28 days, assuring the required strength. The minimum requirements were 3,000 lbs. per sq. in. for Class A concrete, 2,500 lbs. for Class B, and 2,000 lbs. for Class C. Both arches and bridge abutments are of the reinforced concrete type of structure.

The concrete for the first 17½ miles was mixed at a central mixing plant located on the bank of the Monongahela River, at Monongahela City, Pa. The mixing plant location was the site of the plant in barges, and the cement was handled through an adjacent railroad siding.



Delivering concrete from the central mixing plant to one of the many individual jobs on the 17-mile project



Truck delivering load of concrete from central mixing plant

Major Advantages of Central Mixing Plant

One of the greatest advantages of the central mixing plant was found in the ease with which the aggregates could be assembled and stored. Another major advantage arises from the fact that the large permanent mixing plant can be established where the most approved equipment and methods for the control of the concrete can be installed. A third important and obvious advantage comes from the fact that the central mixing plant enables the railway company to inspect the concrete at one source, thereby eliminating the need for placing inspectors at each structure.

Having the stock piles at the central mixing plant was another distinct advantage, for it facilitated the work of testing and grading the aggregate, and also reduced the number of test cylinders needed to ascertain whether the required strength was being obtained.

In this district we often have considerable trouble with sulphate waters; but at the central mixing plant in Monongahela City we had an abundance of pure water. In consequence, we avoided the trouble that might have occurred if the mixing water had been obtained from many different sources.

It is worth noting, too, that the major advantages just enumerated, without a single exception, represent a reduction in cost to the railway company, although the concrete work, more especially in the many small structures, was of better quality than we could have hoped to get with individual mixing plants at each structure.

The writer is, of course, not in a position to state to what extent the general contractor benefited from the economies due to the central mixing plant. The opinion is ventured, however, that the advantages of centralized delivery of materials and central control of operations more than offset the extra cost of truck delivery.

Mixing and Delivery of Concrete

The concrete was delivered to the various structures in high-speed trucks. The greatest time required for the delivery from the mixer to the point of use was about 45 minutes. This was made possible by the presence of improved roads along the entire project.

Some trouble was experienced at the beginning of the work in connection with the workability of the mix, more especially where it had been hauled for some distance and placed in cold weather. The addition of three per cent of Celite resulted in a workable mix at the point of use, even after having been hauled for a long distance.

This work was built under the direction of H. H. Temple, chief engineer of the Pittsburgh and West Virginia Railway. The writer was engineer of construction, and W. C. Kline was assistant engineer of construction.

A Norwegian Viewpoint on Admixture Standards

The need for some sort of classification of admixtures is felt everywhere. The articles on this subject in the December issue, by John G. Ahlers and R. E. Withrow, reflect two opinions on this subject. Following publication of these articles, CONCRETE is in receipt of a communication from a Norwegian civil engineer who classifies all products under five types.

His letter follows:

I fully agree with you that it would be very desirable to classify and try to standardize the large amount of admixtures now thrown on the market.

Without doubt many of them are of value by increasing workability and at the same time increasing the watertightness of the concrete. Very often however the same workability and watertightness could have been obtained by adding more cement. The very interesting article about this same subject by Mr. John G. Ahlers, in the same number of CONCRETE, confirms this in an excellent way. The variation in both strength and watertightness due to curing and grading of the materials are much greater than the variations that can be observed in concrete with and without admixtures.

To cover the admixtures with standard specifications will, however, be practically impossible as many of them are patent products of very complicated composition. I have tried to classify these products and have come to the following main classes:

(1). Silica products, containing silica in active form, claimed to act chemically with the free lime in the concrete. It is generally also claimed that this silica will absorb water and give better conditions during setting, something like the difference between air-cured and water-cured concrete.

Tripoli, Colloy, etc., belong to this group.

(2). Soap products, containing as a rule kalisoaps and free fat. They increase the volume, thus giving a more workable mix, but also naturally increase the voids and lower the volume weight. Said to act water-repellent and also chemically by forming lime-soap less soluble in water than CaO and $CaCO_3$.

(3). Combinations of 1 and 2. Very complicated of construction, for instance, containing:

Saponified fatty acid

Acid of silica	SiO_2
Lime	CaO
Calcium chloride	$CaCl_2$
Kalium	KCl
Natrium	$NaCl$
Kaliumkronat	K_2CrO_4

Sika, Betonit, etc., belong to this group.

(4). Teer products, as Castor, Porolith, etc., acting not chemically but only by filling the voids, and also water-repellent.

(5). Different products belonging to none of the above mentioned groups, for instance, Cal and other products of simple and known chemical composition.

To try to cover products of so different composition with standard specifications is in my opinion hopeless. What we probably could do, however, is to have some of them authorized by the A. S. T. M. with regard to some *special* qualities and ways of influence on concrete. It would then be necessary to split them in two groups:

Group I: *Products acting as accelerators, to give early strength to concrete.*

Group II: *Products giving more watertight concrete than obtainable with ordinary cement.*

A product belonging to Group I should give, after 7 days or before, a compressive strength of about the same as ordinary concrete after 28 days. At the same time no greater shrinkage or lowering of tensile strength should be allowed. Products claiming watertightness effects should be tested for water pressure with distilled water for not less than 50 meters. It should be proved that a mixture of ordinary concrete, 1:3:3 for instance, that is not watertight for this pressure is made watertight by the admixture. At the same time only a slight lowering of the compressive and tensile strength should be allowed.

The stamp of approval should also be made dependent on the economy shown by the tests, in this way, that if the price is so high that adding of more cement to obtain the same qualities is cheaper than using the admixture, no approval should be given.

I think it would be very useful and spare a lot of money now used on admixtures of no real value if tests and an official approval as suggested above could be adopted.

KRISTEN TRIIS,
Consulting Civil Engineer.

Oslo, Norway, December 23, 1929.

Concrete Pavement Awards in 1929

Final figures on contracts awarded for concrete pavements during 1929 have been tabulated by the Portland Cement Association. Following are the separate figures for roads, streets and alleys and the corresponding awards during 1928:

	Square Yards Awarded	
	1928	1929
Roads	93,577,762	92,552,944
Streets	50,808,214	43,452,159
Alleys	3,948,452	3,658,316
Totals	148,334,428	139,663,419

Strength of Steel Beams Encased in Concrete

High Points of European Investigations and Practice—Each Material Considered as Taking Part of Load—Far in Advance of American Practice

By **P. W. LEISNER**
Consulting Engineer, Chicago

THE November (1929) issue of CONCRETE contains a news article on Page 24 describing the load tests on six full-size floor panels built for this purpose at the Gary plant of the American Bridge Company. As stated in that news article, the purpose of those tests was that of obtaining a comparison between the strength of structural steel beams when tested alone, and the strength of those same beams when encased in concrete.

The Gary tests were conducted under the auspices of the Western Society of Engineers, represented by the structural committee of that organization. I was an interested observer of those tests, for I have long been puzzled over our failure to take account of the common action between structural steel members and the concrete in which they are encased. A few previous tests made on this side of the Atlantic, one at the University of Toronto and one at the Dominion Bridge and Iron Company plant near Montreal, have indicated quite definitely that the bond between the concrete and the structural steel remains unimpaired, and that the action of a concrete-encased steel beam is much the same as that of an ordinary reinforced concrete beam. Reports on these tests will be found in the "Canadian Engineer," Vol. 49, p. 655, 1925, and Vol. 51, p. 671, 1926.

Nevertheless, the usual practice in this country has been to consider the concrete only as fireproofing or protection against weathering, and to use structural steel members strong enough to carry the entire load without help from the concrete.

We have known that the concrete does in fact take some of the load, but with the exception of a few isolated cases we have not had either the courage or the initiative to make use of the combined action of the two materials. The failure to do so is all the more surprising when one considers that in Europe the common action of concrete and structural steel has long been recognized and has constituted a part of general practice, even in the design of railway bridges and culverts.

In view of the likelihood that the results of the Gary tests will soon be published by the Western Society of Engineers, a knowledge of the high points of European investigation and practice will be timely. The influence of the concrete in establishing the strength of concrete-encased structural steel beams has been given close attention and study in various European countries since 1901.

Tests made with minute care have shown that even under the weight and impact of railway loading the deflection of the beams was reduced far more than one could possibly have hoped for. Tests of railway bridges repeated after many years of daily frequent loading, have shown that the concrete retains its bond with the steel beams.

German and Swiss Practice

German and Swiss railroads appear to have been pioneers in the use of concrete-encased I-beams. Their engineering departments investigated the characteristics of these structures as early as 1901 by measuring deflections under live load.

Tests by Danish State Railways

Some notes on the subject, in a German periodical, led the Danish State Railways to build a culvert in 1903 with a clear span of 10 ft. 6 in., the construction consisting of old but usable I-beams encased in concrete. The I-beams were German steel, about 10 in. deep, spaced about 20 in. center to center. The top of the beams was about 3 in. below the top of the concrete; the bottom of the beams was flush with the bottom of the concrete. Since it was foreseen that the deflections would be very slight, special precautions were taken to eliminate outside influences. Heavy steel angles were cast into the faces of the abutments and 11-in. I-beams were clamped securely to the angles, as a base for the deflectometer.

The first deflections under live load were measured 100 days after the concrete had been cast. The result was that the deflection was about one-tenth of what it was calculated to be for unencased beams.

Practically the same results were obtained in tests made five months later, after the culvert had been crossed by 10 trains daily during the five months. The influence of the concrete had not been reduced by the shocks and vibrations under the moving trains, although the thickness of ballast between the bottom of the ties and the top of the concrete was but 5 in.

The tests just mentioned are described in greater detail in the Danish engineering paper "Ingenioren," January 4, 1908, page 3. The paper does not state what permissible unit stresses the Danish State Railways adopted at the conclusion of these tests, but a large number of railway bridges of the same type were built from 1903 to 1908, the longest clear spans being 25 ft.

Swedish Tests Over 18-Year Period

In a Swedish engineering magazine, "Teknisk Tidskrift (Vag-och Vattenbyggnadskonst)" 1923, No. 30, p. 22, reference is found to a concrete-encased I-beam culvert of 12-ft. span built in 1905. The thickness of ballast between the bottom of the ties and the top of the concrete was but 4 in., and the culvert was crossed by about 40 trains daily. In 1923, after 18 years of service, accurate measurements were made of deflections under live load, with the result that the deflection was about one-ninth of the calculated deflection for unencased I-beams.

High Working Stresses Adopted

Reference to adopted permissible unit stresses, based on extensive tests of this character, are found in a Swiss paper entitled "Die Brueckenbauten Der Schweizerischen Bundesbahnen in den Jahren 1901 bis 1926" (The bridge building of Swiss Federal Railways during the year 1901 to 1926), page 17. In order to simplify the work of the designer the added strength obtained from the concrete is taken into account through the simple expedient of adopting high unit working stresses in the steel, and again figuring the steel action alone. The working stress so adopted is much higher than would be permissible with unencased steel, so that the influence of the concrete is in fact taken into account. For instance, in the Swiss Federal Railways paper just mentioned the unit working stress for the dead load plus the live load (but omitting impact) is given as 1.5 tons per square centimeter (21,300 lbs. per sq. in.). While on first impression this figure seems unduly high, it is not of alarming proportions when one considers the surprisingly great influence of the concrete, and the further fact that this influence was sustained without impairment over a period of 18 years of hard service.

Buying Program Expands

Approximately 1,000,000 barrels of cement and comparable amounts of other concrete materials are included in the buying program of the Austin Company of Cleveland for building materials for the entire year of 1930. This program represents an increase of 20 per cent over the company's purchases of supplies for 1929.

These purchases do not include those which will be made in connection with the company's $40,000,000 automobile plant and industrial city project in Russia and other contemplated work abroad, which will be handled by its newly created foreign operations department.

Pouring Record Made with Ready Mixed Concrete in Grain Bin Job

In the construction of 18 storage bins last summer for the Portland Flouring Mills of Portland, Oregon, the Macdonald Engineering Company of California, established what is believed to be a new record for continuous pouring.

Starting at 8 a. m. July 9th six transit trucks delivered and poured continuously for 122¾ hrs., completing the job at 6:45 p. m. July 14th. The 18 bins were 16 ft. in diameter, 67 ft. in height, with a wall thickness of 6 in. Perfect Mix concrete was employed.

Another feature was the use of 90 jacks which worked around a 1 in. road which raised the platform and forms as the concrete was poured. The concrete was delivered in the trucks at 29 min. intervals, dumped and raised up in the tower, run into concrete buggies on the platform and dumped into the forms. As fast as a batch was taken care of the men stationed at the jacks operated a lever raising and gauging the latter. The gauge regulated ½ in. spaces so that there was no guesswork in the distance the forms were raised. As soon as the forms were raised men immediately brushed off the surface with a thin compound of cement and water, leaving a monolithic structure with no marks of forms or joints.

John S. Metcalf Co., Ltd., Vancouver, B. C., were the designing engineers.

Coming Conventions

February 10th—National Concrete Products Association annual meeting. Hotel Roosevelt, New Orleans, La.

February 11th and 12th—Cast Stone Institute annual meeting, Hotel Roosevelt, New Orleans, La.

February 11th to 13th—American Concrete Institute annual convention. Hotel Roosevelt, New Orleans, Louisiana.

February 19th and 20th—Iowa Concrete Products Association, annual meeting. Des Moines.

March 31st to April 2nd—Concrete Reinforcing Steel Institute sixth annual meeting. Bon-Air Vanderbilt Hotel, Augusta, Ga.

Winning the Help of the Mason Contractor

How "Cal" Gochnauer Gets the Mason Contractor to Demand His Block

THE question of how far the concrete block manufacturer can or ought to go in furnishing "specials" to mason contractors has been the subject of argument among block manufacturers for a long time. Undoubtedly local conditions have an important bearing on the question. What is advisable or even necessary in one market may be unnecessary in another. It is not the purpose of this story to analyze the problem. In it we are simply going to present the experiences of "Cal" Gochnauer of Appleton, Wisconsin, who believes that the mason contractor can make or break the concrete products manufacturer.

One job switched from clay tile to block through the mason contractor. Seven thousand units were used in this $75,000 house at Appleton, Wis.

More Than 75 Per Cent of Sales Through Masons

That Mr. Gochnauer's policy is effective in his market is demonstrated by the fact that he sells more than 75 per cent of his production through the mason contractor. The accompanying illustrations show a few of the desirable jobs that have been switched to Gochnauer's block through the influence of the mason contractor.

The plan of co-operation with the mason contractor is built up on the belief that the concrete products manufacturer must give better service than the clay unit manufacturer if the mason is going to use his influence in favor of concrete units and particularly in favor of Gochnauer's concrete units. To attain this attitude, a definite plan involving several items of service has been put into practice.

"Specials"

Mr. Gochnauer believes that the concrete products manufacturer must supply special units. Standard sizes are not enough if the good will and active co-operation of the mason contractor is wanted.

Accordingly he carries a considerable stock of "specials." These are made up at slack times in the plant and, as a result, the cost is not so great. Though this plan entails an investment in extra stock, the cost of the extra units is not great when it is considered as a sales expense. Besides, the specials are sold at a higher price, their selling price being fixed high enough to insure a profit.

Among the specials carried in stock are:

(1) Block ranging from 4 in. to 24 in. in length made up in units varying in length by 2 in.

(2) All types of block are carried in 4 in. and 6 in. heights as well as standard heights.

(3) Forty-five degree block for bay windows and angles.

(4) Several types of inside corners.

(5) Joist block and joist fillers.

On some jobs special designs are made up to fit the particular needs of that job.

An Erection Diagram

Another item of service developed by Mr. Gochnauer is the supplying of "erection diagrams" to the mason contractor. On every job that is sold, unless it happens to be a simple rectangular structure, an erection diagram is made up by Mr. Gochnauer and given to the mason to help him in his work.

The procedure on a typical job is as follows: When the architect's drawing is completed and sent out for bids, it is studied from the point of view of the mason contractor. Then details are drawn showing the best method of laying up the walls with concrete block. Wherever there are angles, curves, or special conditions not easily handled by standard block, the specials are fitted in or a new block is designed to meet the special need.

These detailed masonry drawings are then used as a basis for estimating the job and for placing the order. They are then given to the mason contractor as an aid in building the irregular portions of the structure.

Not content with this service, Mr. Gochnauer goes out to the job and gives the contractor grade stakes with a surveyor's level. If necessary, he will remain on the job long enough to give the contractor any special assistance he needs.

Block are never hauled to the job until the work is started and the block are delivered as they are needed. Either "Cal" Gochnauer or his brother, who is associated with him, watches the job closely, giving such assistance as is needed to speed up the work or to secure better construction.

One of the points made with the mason contractor is that he will never be out a penny because of failure to deliver the block when they are needed. Mr. Gochnauer has made a standing offer that he will pay for any lost time due to failure to deliver the block as needed. In his many years of manufacturing, he had to make good on this offer only once, because of truck trouble. This one feature alone, according to Mr. Gochnauer, has brought him a lot of business.

All these items of service to the mason contractor have paid. They are not very expensive and they bring good returns when considered as sales expense. Job after job has been swung to the plant by the mason contractor because of them. Masons have sold owners on the value of concrete block as a building material. They have been instrumental in switching jobs from other types of construction to concrete block and they have insisted and are insisting on using Gochnauer's block because of the special service that goes with every order for block.

Clay tile were specified in this addition to the County Sanatarium in Outagamie Co., Wis. The mason contractor received the job for Haydite because he put a special bid in on it which was below the clay figure. Twenty thousand twelve-inch units were used

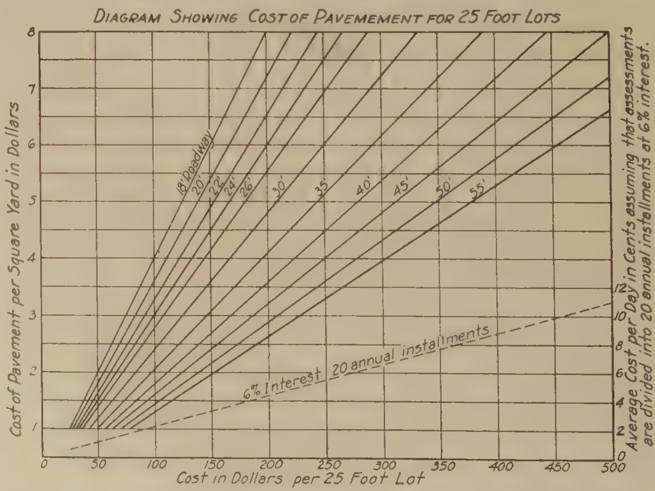
* * *

A Diagram for Estimating Pavement Cost

The cost of pavement per 25-foot lot is shown on the accompanying diagram, for different widths of roadway and various prices per square yard of concrete. The average cost per day when payments are distributed over a 20-year period, is also indicated.

In finding the cost of a 30-foot pavement in front of a 25-foot lot find the cost per square yard along the left-hand edge of the diagram. Suppose it is $3.00 per yard. Follow the horizontal line opposite the $3.00 per yard until it intersects the diagonal line for a 30-foot roadway. Vertically below this intersection find the cost per 25-foot lot, which is $125. If the cost for lots of some width not given on the diagram is desired it may be found by reducing the above figure to cost per front foot and multiplying by the width of the lot in question. The cost is figured to the center of the street only, on the theory that the lot on the other side of the street will pay for the other half of the pavement.

What it costs per day, per 25-foot lot to have a pavement is also shown on the diagram, assuming the life of the pavement is 20 years and that the interest rate is 6 per cent. Using the previously assumed problem as an example, follow the vertical line through the intersection of the $3.00 per yard and 30-foot roadway lines to its intersection with the dash line. Horizontally to the right of this point find the cost a day, which is 2.7 cents.



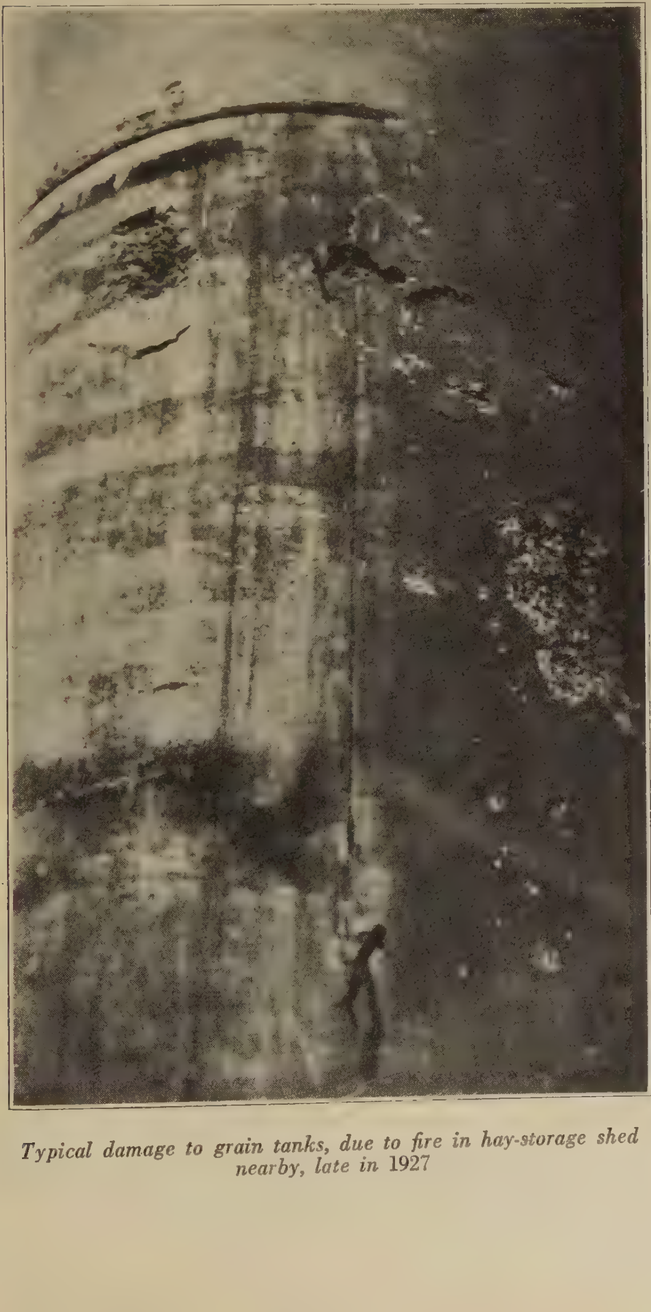
The diagram was worked up by S. A. Siverts, Jr., consulting engineer of Minneapolis, Minnesota.

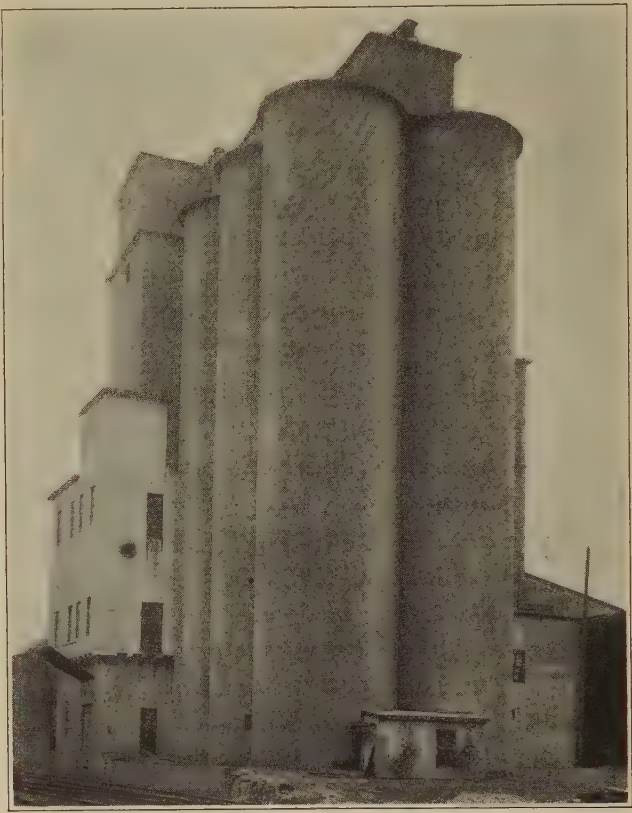
Repairing a Fire-Damaged Grain Elevator in Cold Weather

Concrete on Structure Expanded and Spalled to Reinforcing—Irregularity and Variable Thickness Present Repair Problems—Difficulties Overcome by Use of High-Alumina Cement

By EDGAR STEPHENS
General Contractor, Cairo, Illinois

LATE in the fall of 1927 a large hay storage shed abutting the property of the Samuel Hastings Elevator at Cairo, Illinois, burned to the ground. The direction of the wind was such that the elevator house and six large grain silos were exposed to intense heat. The concrete surfaces of these structures expanded and spalled off, exposing the reinforcing in many places. The worst damage was done to the corners of the elevator house where the concrete was damaged to a depth beneath the line of reinforcing. Naturally, this concrete had to be repaired to protect the reinforcing from the attack of the elements.


Typical damage to grain tanks, due to fire in hay-storage shed nearby, late in 1927


Samuel Hastings Elevator at Cairo, Ill. Repaired surface in perfect condition in July, 1929

Exposed Reinforcing

The problem of repairs was a difficult one, at best. It is not considered a simple matter to apply a coat of mortar or concrete to an old concrete structure, particularly when the new application is irregular in shape and variable in thickness. It was at first thought advisable to await warm weather to insure favorable atmospheric conditions, but it was found that the reinforcing was being injured by exposure and that the unsightly appearance of the structure was an annoyance and possible detriment to business. Accordingly, arrangements were made to make the repairs as early as possible.

Some delays were encountered in investigating materials and methods for the work. These items required very careful consideration. The method adopted had to be economical and quick, which made its choice dependent upon the performance of the material chosen. The prime consideration for the concrete was density, or imperviousness. The concrete was required to bond well with the damaged structure, both with the old concrete and the steel. To be used in low temperatures the concrete must be protected against the retarding influence of cold or frost damage; it should have rapid-hardening qualities to facilitate completion of the work and to minimize the time period of expansion and contraction.

The properties of various cements were investigated, and a high alumina cement was chosen because of its well-known ability to develop full strength despite low atmospheric temperature, and because its other qualities seemed to meet the requirements of the situation. The additional cost of this special cement was a negligible percentage of the entire cost, since only 25 barrels of cement were required. Form and labor costs were by far the largest items.

Repair work under way in March, 1928. *The surface had been bush-hammered to remove all damaged concrete*

Method of Repairing

The procedure followed was to prepare the damaged surface by chipping away the face with bush hammers to remove all loosened concrete. The hammered face was then washed with muriatic acid and then thoroughly rinsed with clean water. The concrete or mortar was then placed. In the case of the elevator structure the spalling was deep enough to permit the use of forms. The grain silos were resurfaced by trowel.

The application to new surfaces was accomplished by first grouting the damaged face (while still wet from being washed) with a mixture of high alumina cement and water. The mortar, mixed in the proportion of 1:2½, was then placed while the grout was still wet. Surfaces were wood-floated about three hours after placing, to develop a sand finish. The action of the cement was very rapid and considerable attention was paid to the curing, which was accomplished by sprinkling with water about nine hours after mixing, and thereafter as frequently as required to keep the surface damp until twenty-four hours had elapsed.

Bond Proves Satisfactory

The work was carefully inspected after curing to detect any cracks, curling, hollow spots or surface defects, but nothing of the kind was found. At the expense of considerable effort a small piece of mortar was broken out by repeated blows with a three-pound wedge peen hammer. When the mortar finally broke away it brought a piece of the old concrete with it, proving that the bond was at least as strong as the old concrete.

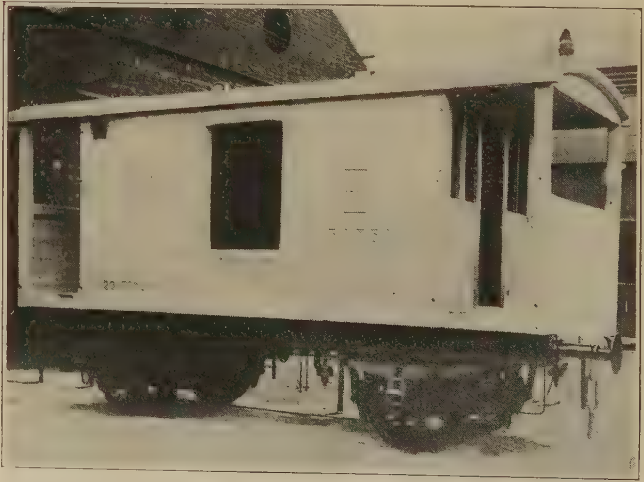
The illustrations show the repair work in progress in March, 1928, and a view of the structure in July, 1929, taken on the side where the fire-damage occurred. The new surfaces were inspected in May, 1929, and found to be flawless and firmly bonded, as good as when the work was completed.

British Build Experimental Freight Car of Concrete

The accompanying illustration shows a freight car built of reinforced concrete in England as an experiment. A standard steel underframe was used, some of the main members being embraced by the concrete floor to obviate the use of anchor bolts.

The standard body equipment is provided, the bolts for securing the fittings being anchored in the concrete. The vehicle weighs approximately 22½ tons.

The initials "N.E." and the vehicle number are molded in the concrete and the whole structure is finished in the standard colors adopted by this railroad for its cars.



The weight of the concrete is such that full tare can be obtained without fitting the usual cast iron ballast weights.

The car was built at the London and North Eastern Railway car shops at Temple Mills, England.

An Average Association Day

Being More or Less of a Personal Narrative of Some of the Things that Pass Across the Desk of the Manager of Products Co-Operative Association During a Working Day—A Resume of What Has Gone Before

By "SPEC" COLLINS
Manager, Milwaukee Concrete Products Co-operative Association

ONE day last October, the Editor of CONCRETE sat in the office of the Milwaukee Concrete Products Co-Operative Association discussing the workings of this but recently formed co-operative sales organization. An hour had been spent talking about the association and it was decided that a series of three stories would adequately cover the inquiries CONCRETE had been receiving regarding the organization.

The Manager's Work

The first of these stories was to be of a general nature, outlining the formation of the organization and its purposes. The second was to deal with the sales methods. The third was to outline the methods used in collections after sales were made. We thought that settled the story proposition; but while this conversation was going on, telephone calls had been coming in, and three or four people had stopped in the outer office to talk to the manager. It was then the Editor spoke. "It seems to me that there are a lot of things about running an organization such as this that you have not told me. As I sat here and listened to you answer phone calls and noticed the number of people coming in to see you personally, it occurred to me that a human interest story might be written outlining some of the details of your job—that of co-ordinating the operations told in the other three articles. What you have been telling me always concerns someone else. Yet it seems that a lot of people want to deal with the manager, and that you are continually called on to make decisions that cover the operation of the whole organization. Would you be willing to write a rather personal story dealing with your own side of the association work?"

That gave the writer an idea. He realized that while necessarily most of the contacts made by the organization would be through the salesmen and the credit department, and that most of the phone calls coming in to the association would be handled by the office force, there was also a great amount of contact with the manager himself. So this is more or less a personal narrative and a story in running fashion of the actual contacts that the manager makes and that are made with him. In an association such as this the manager should always be glad to make these contacts because it gives him an insight into the minds of the people with whom he is dealing and with whom his personnel is dealing, and makes him better able to plan the association activities in general.

It may be stated here that an association day is a long day. It starts at six in the morning and is seldom over at six at night. That is because of the nature of the business and of the people with whom the association does business. By this I do not mean that everyone is on the job at six in the morning. The schedule is staggered so that one man arrives at six, the others at regular intervals up to eight, when the entire force is on the job. So here goes—a typical day in the office of the manager of the Milwaukee Concrete Products Co-Operative Association. It is hoped that this story will draw together some of the things that have been written before.

Sales Conference Begins Day

It is seven o'clock, and the first item in the day's business is a conference with two of the salesmen on orders they have landed over the telephone the night before. They have been talking these over before I arrived, and there is some question about accepting one because of a poor credit rating. It is decided to make an investigation of the financing before making delivery on the job. Other salesmen arrive and together we go over our accounts receivable and each man gets a list of delinquent accounts that he is made responsible for. Our credit man reports on calls made the night before and waivers are issued so that collections can be made that day at building and loan associations. When this business of credit and collections is over we have a round table conference over prospects for the day's business. The salesmen start out for the day.

One of our members calls. He has an order that has come in to him and asks for an O. K. on credit and authority to deliver. A call from one of the salesmen—he is checking back on credit information on a customer we talked about the day before. Together with our credit man, I go over a number of small accounts that have been hanging fire and on which I have had no report for some time. He also tells me that he has made a thorough check on a contractor who is having some good sized work requiring block coming up soon.

A call from the Real Estate Board. Their new year book goes to press soon and they wish our advertising. The Portland Cement Association calls regarding block for a model home to be built in a west side suburb. I get a call from a friend inquiring if we need more salesmen and recommending a man.

I then check over our list of mason contractors, selecting a dozen names to recommend to a firm which contemplates considerable building. A personal call from the advertising department of a large Milwaukee daily—nothing doing for him right at the present. My credit man again consults me on a rather doubtful credit risk. A salesman from a stationery house wants to sell me a visible file. I listen but do not buy.

Trade Reports

The morning mail arrives—always something to look forward to. There are a goodly number of checks this morning, also a few bills. Some interesting letters also from people having something to sell and from others asking for information. I check over the Dodge reports and mark them, assigning them to the salesmen. Then there is the "Western Builder" to check to see what prospective construction work has come out today. "The Daily

Reporter" came in the mail. It is checked to see whether liens or judgments have been issued against any of our customers or prospective customers. These are checked and passed on to the credit man.

The current quota sheet is brought in. I check it and make marginal notes for the salesmen. These will be gone over in detail this evening. One of the salesmen comes back. He has dug up a big job and wants to go over an outline of argument in approaching the contractor who probably will get it. A half dozen phone calls have come in the meanwhile, all relative to jobs or credits.

I then check over the manifests that have arrived in the morning's mail, then comes a check on the current month's business and the accounts receivable. A member arrives with his manifests on yesterday's business. This morning he brings a copy of "The Specialist" with him. We kill a half hour, partly business, partly not. Now comes a lengthy phone conversation with the manager of another association. We have been trying to get an extension of discount period with his organization, as we do not pay off our members until the fifteenth. He tells me that he has arranged it, with reservations. My monthly bulletin to contractors should have been back from the printers this morning. It is past noon now and the bulletin is not in. I find out why. A prominent machinery man sticks his head in the door and inquires about having lunch with him. We chew the food and fat at the corner drug store.

Contact with Members

When I get back a member is waiting. He wants a lien waiver so that he can make a collection for us. We go over some of the accounts that he has outstanding since before the association was organized. We are now in a position to help him collect some of them. He feels that his quota is not being filled to his satisfaction. We spend a half hour going over his business, past and present, and even delve into the future. He leaves, feeling better—and so do I. We've both learned something.

Back numbers of "Western Builder" are now checked to get a record of old jobs on which I have not had a report. A customer comes in. He questions a new ruling on garage construction just put out by the Milwaukee Building Department. Some things in it are not clear to either of us. I load him into my car and we make a hurried trip to the Building Department. Five minutes there straightens us out. On the way back he outlines special block he will need on the job. I place the order for the specials and other block to go on the job. A member comes in with a question about a bill rendered by us to one of his old customers. We straighten that out. A customer comes in to talk golf and football, but gives us a sizable order before leaving. Another customer comes in with plans for a large garage to be figured.

Credit Questions Come Up

New supplies are to be ordered for the office. We check them over and decide where to place the order. The day's dictation is taken care of. Our auditor arrives to make one of his frequent inspections of the association books. We have several questions for him to answer and he has several to ask us. Everything is ship-shape. Two phone calls regarding credit, one about a prospective customer and one regarding one of our members. Another advertising solicitor puts in an appearance. A member calls regarding a job—the customer is in his office and wishes to have the block billed through the general contractor. I check the general contractor and call back O. K. A customer comes in to pay his bill and get a waiver.

A service man for one of the cement companies comes in. His firm has published a book on credits and collections that he thinks may be of use to us. It is. He consents to send a copy to each of our salesmen. A member calls regarding collection on a job which he has furnished. A man selling desk registers. Another member. He brings in cash he has collected for us on a job we had him furnish. Our treasurer phones. He wants to know how collections are coming in and the probable amount we will have to borrow to pay off on the fifteenth. A member phones in an order. Another call or two.

I start work on a list of association brands for the Milwaukee building department. The salesmen start to come in. Each has some particular thing that has come up during the day to talk over. One puts over a tough job of selling, another has bad luck in a collection promised to him. They talk over collections and credit with our man in charge of that department. Then we all get together. The day's business and future business is discussed. Quotas are analyzed, and plans made to bring them better in line. Credits are talked over, the salesmen have phone calls to make that night, the manager has a meeting with a home modernizing committee. A typical association day—fifty-nine separate transactions have gone over the manager's desk, part by telephone, most of them handled personally. And this is but a small part of the workings of the association—every man, every girl has been doing his or her share. Their's is a particular task, but the manager gets a little of it all—and likes it.

Concrete Stave Silo Men Predict Good Business in 1930; Suggested Surfacing Treatment

Approximately 50 manufacturers of concrete silo staves, representing this important division of the National Silo Research Council, attended a meeting at Portland Cement Association headquarters, Chicago, early in December, to discuss current problems of their industry. Manufacturers predicted that 1930 will be an even better silo year than 1929, which was one of the biggest years in the silo business.

The program included a review by W. G. Kaiser, assistant manager of the Cement Products Bureau, Portland Cement Association, of experiments conducted for the past five years with various materials to determine their effectiveness as a surfacing for concrete silos. One of the two materials which are giving the best results in resurfacing or reglazing walls that have become roughened through service is a portland cement wash containing powdered iron. The other is a commercial magnesium fluosilicate preparation. Either of these materials is also satisfactory for treating new silos, he said.

British Testing Road Concretes in 20-Ft. Slabs

A special stretch of road with a surface composed of concrete slabs of a number of different types has been opened for a traffic test near London, England. The test road, specially constructed for the purpose at Harmondsworth, is 600 yards in length and its width has been restricted to 20 feet, so that only two streams of traffic may flow along it and weight and wear may be concentrated.

This test road has been prepared by the Ministry of Transport with the advice of a committee representing engineering and research interests and the users of automobiles and commercial vehicles.

Buried Reservoir Design

The Calculation of Reinforced Concrete Water Reservoirs Buried Underground

By **DAVID LANDAU**

Part II

(Continued from October, 1929, Issue)

Sometimes the bottom of a reservoir is made dome shape, particularly when such reservoirs are placed on a series of posts. Since such bottoms are subject to compression stresses they may be made rather light.

Covers for underground reinforced concrete reservoirs are invariably made dome shape and as we shall make the cover of the reservoir soon to be calculated of this form we will discuss the general case in the following.

The following analysis by Pierre Bescond[1] will give the reader the essential elements required. See Figure 5.

Let $r =$ the radius at the circumference of the dome shaped bottom or cover.

Let $f =$ the camber or arch as shown by Figure 8.

Let us designate the ratio,

$$\frac{f}{2r} = s$$

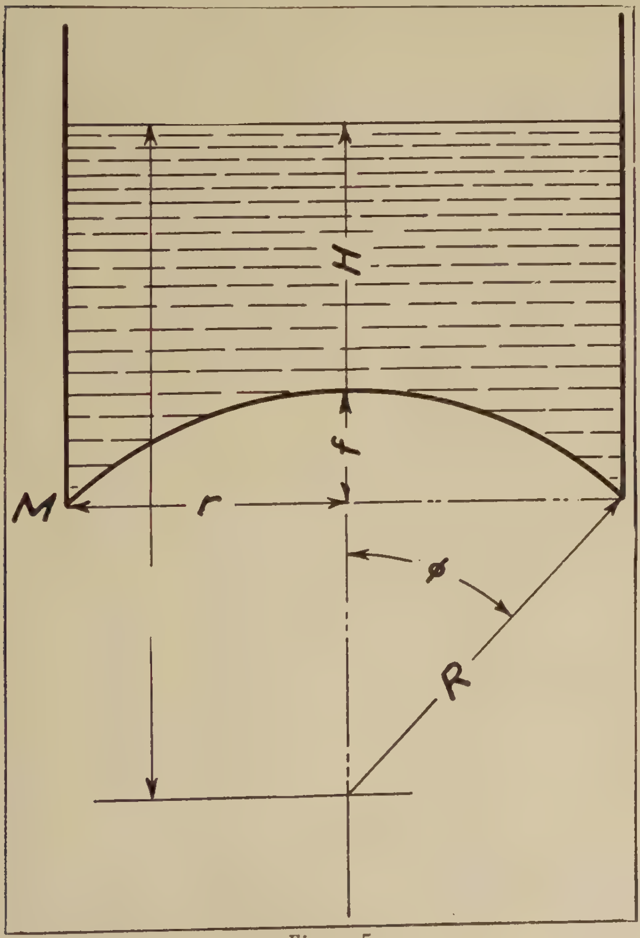


Figure 5

The radius of curvature of the dome is given by the following relation:

$$R = r\beta = \frac{1+4s^2}{4s} \text{ or } \beta = \frac{1+4s^2}{4s}$$

From which it is seen that if s is given, we may easily find β and consequently R which equals $\beta\, r$.

The area of the dome shaped head, or bottom, is readily found from the relation:

$$A = 2\,\pi R\, f$$

The volume of the dome is:

$$V_o = \pi\, f^2\, (R - \frac{f}{3})$$

When the loads act on the convex face of the dome, we find that there are produced two distinct compressive stresses. One is tangent to the meridian and has a value of the following per foot length of its parallel, viz.:

$$N = \frac{R}{E}\left[\left(\frac{A}{2} - \frac{R}{3} \cdot \frac{\cos^2\phi + \cos\phi + 1}{1 + \cos\phi}\right) \times 62.5 + \frac{W E}{1 + \cos\phi}\right] \quad (12)$$

The other compressive force is tangent to the parallel and has for its value per foot length of the meridian:

$$Q = -N + \frac{R}{E}\left[62.5\, A - (62.5\, R - We)\, \cos\phi\right] \quad (13)$$

Wherein:

$\phi =$ angle of radius of curvature with the vertical
$p =$ weight of dome per square foot area
$A =$ distance from water level (full reservoir) to center of radius of curvature.
$W =$ weight of 1 cu. ft. concrete.
$E =$ thickness of wall in feet.

At the highest point of the dome $\phi = O$ and the two compressive forces become equal, so that we have:

$$N_o = Q_o = \frac{R}{2\, e}\left[(A - R)\ 62.5 + We\right] \quad (14)$$

In the case of a spherical dome used as a cover for a buried reservoir, such dome supports besides its own weight a load of earth and, not infrequently, surcharges consisting of live-loads of some nature. In this case it is necessary to include in the estimate of the value of p the entire load supported by such cover.

Where we have no water load on the cover, the above equations may be written as:

$$N' = p\, R . \frac{1}{\cos\phi + 1} \quad (15)$$

$$Q' = p\, R . \frac{\cos^2\phi + \cos\phi - 1}{\cos\phi + 1} \quad (16)$$

$$N'_o = Q'_o = \frac{p\, R}{2} \quad (17)$$

Equations (15), (16) and (17) give the efforts at the circumference or origin, that is to say adjacent to the cylindric wall, whereas equation (17) gives the stress at the top of the dome T. These three equations are then the ones useful and necessary to calculate reservoir covers when they are dome shaped.

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[1] *Ingenieur Constructeur*, Nov. 1, 1918.

In cases where the dome forms the bottom and is, as a consequence subjected to a water load, we must determine this load to which is added the permanent load due to the dome weight itself. In order to find the stresses produced by the water pressure it is necessary to make $p = 0$ in equations (12), (13) and (14) and we then get:

$$N'' = 62.5\,R \left[\frac{A}{2} - \frac{R}{3}\,\frac{\cos^2\phi + \cos\phi + 1}{\cos\phi + 1} \right] \qquad (12a)$$

$$Q'' = -N'' + 62.5\,R\,(A - R\cos\phi) \qquad (13a)$$

$$N''_\circ = Q''_\circ = \frac{62.5\,R.}{2}\,(A - R) \qquad (14a)$$

And if we substitute for A its value, that is to say $H + R$, in the above three equations, we may then write them as:

$$N'' = 62.5\,R \left[\frac{H}{2} + \mathrm{R}\left(\frac{1}{2} - \frac{1}{3}\cos^2\phi + \cos\phi + 1 \right) \right] \qquad (18)$$

$$Q'' = -N'' + 62.5\,R\,[H + R\,(1 - \cos\phi)] \qquad (19)$$

$$N''_\circ = Q'' = \frac{62.5\,R\,H}{2} \qquad (20)$$

where equations (18) and (19) give the loads at the origin or circumference O, and equation (20) that at the top of the dome T.

And these three equations are applicable to dome shaped bottoms since they give the effect of the water load thereon.

To calculate the cross section of the dome where the stress is greatest, that is to say at its origin, which is the circumference, we must know the vertical loads per unit length, that is to say per foot, of the circumference.

If we project N on a vertical plane, we get:

$$V = (N' + N'')\,\sin\phi \qquad (21)$$

If, on the other hand, we project N on a horizontal plane, we will have as a result $N \cos\phi$ and, as a consequence thereof, the tension at the base, that is to say the circumference of the dome, will be:

$$F = \tfrac{1}{2}\,(N' + N'') \times \cos\phi \qquad (22)$$

In general all the above calculations are greatly simplified because we are, as a rule, only interested in the maximum stress which occurs at the dome's circumference where ϕ is a maximum.

If we designate by U the equivalent, or combined equivalent of steel and concrete areas, in other words, reduce the reinforced concrete section to a homogenous concrete section so that $U = C_s + mS_s$ in which C_s is the area of the concrete, S_s area of the steel and m the elastic moduli ratio of steel and concrete, we shall then have the stress given by:

$$\frac{N' + N''}{U_1}$$

$$\frac{Q' + Q''}{U_2}$$

The preceding expressions are rather complex for arithmetical computation but then they may be put in form easier for practical use. Thus we may construct tables of the trigonometric functions for the limiting cases which we know to exist in practice. We will thus have:

$$\sin\phi = \frac{r}{R} = \frac{r}{\beta R} = \frac{1}{\beta}$$

and

$$\cos\phi = \frac{R - f}{f} = 1 - \frac{f}{R} = 1 - \frac{2rs}{\beta r} = 1 - 2\frac{s}{\beta}$$

If then we set up certain values of s we can compute the other values. We have done this in Table IV.

The reader's attention is here called to the fact that as equations (21) and (22) are general, and since in the case of a cover the value N'' is zero, these two equations reduce to:

$$V = N' \sin\phi \qquad (21a)$$

and

$$F = N' r \cos\phi \qquad (22a)$$

Calculation of Flat Floor or Bottom

We have just shown how we must proceed in the calculation of dome shape floors and it now remains to show how we calculate the usual flat floor or bottom.

The true bending moment of the flat reservoir floor is difficult of exact calculation because we do not really know how the soil supports the floor. In this respect we are just as much, or as little, in the dark as when estimating raft foundations under buildings. However, practice has proved that some allowance may be made for our ignorance and we have still a means of expressing the moments in a more or less empiric fashion.

If we consider the superimposed loads resting on the floor as being practically uniformly distributed, including that of its own weight, then we may assume the floor as a fixed beam carrying a uniformly distributed load p per unit area.

Assuming that the soil offers but little resistance, a condition not always true, but which permits us to be "playing safe," then the bending moment may be written as:

$$\text{B. M.} = \frac{p\,l^2\,K}{12} \qquad (23)$$

TABLE IV

$f = 2rs$	$R = Br$	$\frac{1}{\cos\phi + 1}$	$\frac{\cos^2\phi + 1 \cos\phi - 1}{\cos\phi + 1}$	$\frac{1}{2} - \frac{1}{3}\left(\frac{\cos^2\phi + \cos\phi + 1}{\cos\phi + 1}\right)$	$1 - \cos\phi$	$\sin\phi$	$\cos\phi$
$S = 0.07$	$B = 3.64$	0.510	0.452	0.009	0.0384	.275	.9615
0.08	3.20	0.513	0.437	0.013	0.0500	.312	.9500
0.09	2.86	0.516	0.420	0.016	0.0629	.349	.9371
0.10	2.60	0.520	0.403	0.019	0.0769	.384	.9231
0.11	2.38	0.524	0.384	0.023	0.0924	.420	.9076
0.12	2.20	0.529	0.363	0.027	0.1090	.434	.8910
0.13	2.05	0.534	0.340	0.031	0.1268	.488	.8732
0.14	1.93	0.539	0.316	0.035	0.1451	.518	.8549
0.15	1.82	0.545	0.290	0.040	0.1648	.549	.8352
0.16	1.72	0.551	0.263	0.045	0.1860	.581	.8140
0.17	1.64	0.557	0.235	0.050	0.2075	.610	.7925
0.18	1.57	0.564	0.206	0.055	0.2291	.637	.7709
0.19	1.51	0.572	0.176	0.060	0.2515	.662	.7485
0.20	1.45	0.580	0.144	0.065	0.2760	.690	.7240

Where,

p = the uniformly distributed load per unit surface
l = length of floor, or diameter if circular
K = a coefficient depending on dimensions; for a square

$$K = \frac{1}{3}$$

Now if the floor be circular we may take but 82/100 of the above value so that, for a circular floor, we may write equation (23) as:

$$B.\,M. = \frac{p\,l^2\,K\,82}{12 \times 3 \times 100} \qquad (23a)*$$

Now that we have shown how we can calculate the three elements of a reservoir, namely, walls, cover, and bottom, we may show how they are applied to the study of a particular instance. We have selected for this purpose a reservoir of 40,000 gallons capacity.

Dimensions of the Reservoir—Calculation of Details—The dimensions settled upon because of space limitations were as follows: Diameter 22 ft. 6 in. inside. Height to lowest part of the domed cover from bottom, 14 ft. 8 in. Surcharge, 550 lb. per sq. ft. The weight of earth taken as 113 lb. per cu. ft. and angle of repose = 45 deg.

The edge of the top of the reservoir will be placed 60 in. below the top of the soil and the arch or camber given to cover will be 30 in. The highest water level when the reservoir is full will be then 60 in. from the top of the soil and we are thus assured of no troubles from freezing.

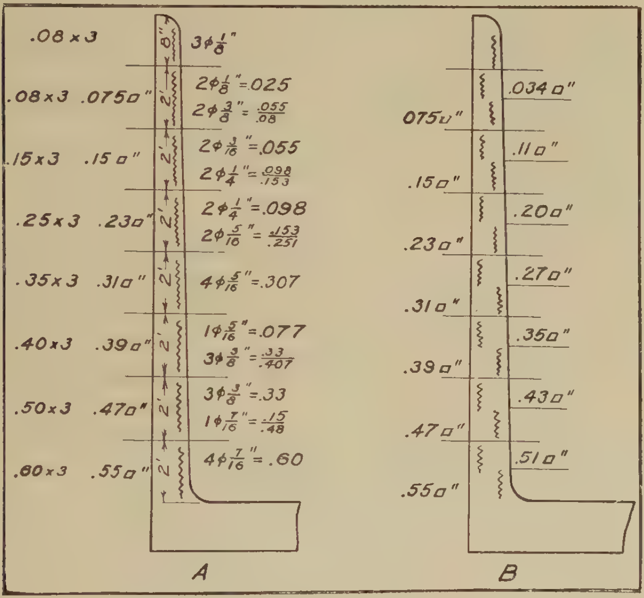

Figure 6

Calculation of the Wall Reinforcement—Since we have a surcharge of 550 lbs. per sq. ft. which surrounds the wall of the reservoir, its effective pressure will be:

$P_1 = 550 \times 2 \times 0.086 = 94.6$, say 95 lb.

The pressure due to the thrust of the soil is:

$P = 113 \times 0.086 \times 2 \times 14.75 = 287$ lb.

To this pressure must be added that of the surcharge of 95 lb., which will thus make a total pressure of 382 lb. at this depth.

The water pressure in the shell at 14.75 ft. depth will be $14.75 \times 62.5 = 922$ lb.

If now we take the effective earth thrust to be but one-half of that calculated above, namely, $382/2 = 191$ lb., then the effective water pressure acting on this wall at a depth of 14.75 ft. will be:

$922 - 191 = 731$ lb. per ft. (linear)

The diameter of the reservoir was 22.5 ft. so that the radius will be 11.25 ft. Hence the radial pressure at the lowest part of the wall, per linear foot, will be $11.25 \times 731 = 8260$ lb.

This load, 8260 lb., comes on the reinforcement and if we allow a working stress of 15,000 lb. per sq. in. we will have to have an area of wire of

$8260/15{,}000 = 0.55$ sq. in. per sq. ft.

This area may be had by using rounds, in which case we will need 4 bars per foot of 3/16 in. diameter, area = 0.6 sq. in. or, better still, we may make use of any of the several forms of triangular mesh or expanded metal sections, using a 60 by 3 mesh, whose area is 0.6 sq. in. per sq. ft. We have indicated this construction diagrammatically in Figure 6 A.

If we carry this section up for a height of, say, 2 ft., then we will need to calculate the new earth pressures, the water load and, as before, calculate the steel required. We will do so for this new section and we have:

$P = 113 \times 0.086 \times 12.75 \times 2 = 250$ lb.
P_1 = same as before or 95 lb.

Total earth load 345 lb.

Water pressure at the height of 12.75 ft. will be:

$12.75 \times 62.5 = 796$ lb.

Effective radial pressure

$$796 - \frac{345}{2} = 624 \text{ lb.}$$

Tensional effort $11.25 \times 624 = 7050$ lb.

And steel area required

$$\frac{7050}{15{,}000} = 0.47 \text{ in.}^2$$

We have indicated this in Figure 6A at the section of the wall from 12.75 ft. depth to 10.75 ft. depth.

If it be thought that 2 ft. give us reinforcing bar dimensions which are not accurate enough we can reduce these intervals to 1 ft. each and we will get the results shown in Figure 6B. It is seen that the results are not appreciably different in the two cases.

In the same manner, as above indicated, we continue to evaluate the reinforcement required until we reach the top of the reservoir wall.

Now it may be shown that, in the case of a reservoir placed above the ground, and taking a wire stress of 15,000 lb. per sq. in. and if we call D the diameter of the reservoir in feet, H its height, also in feet, then the area of reinforcement at any height will be given by the equation:

$$A_w = 0.0021 \times D \times H \qquad (24)$$

Where A_w is the area in square inches per foot.

If now the reader cares to see the effect the earth pressure has in reducing the material required for our reservoir he might apply the above equation to our case at, say, the greatest and smallest depth to see the variations he will get.

For the greatest depth we will have:

$A_w = 22.5 \times 14.75 \times 0.0021 = 0.696$, say 0.7 sq. in.

We have found above that we required but 0.55 sq. in. so that this shows a saving of about 20 per cent. As we rise higher, the difference becomes less marked and at 2¾ ft. height we would need 0.85 sq. in., according to equation (24), whereas we found for the buried reservoir an area at this point of 0.075 sq. in. There is only 12 per cent difference.

(To be Continued)

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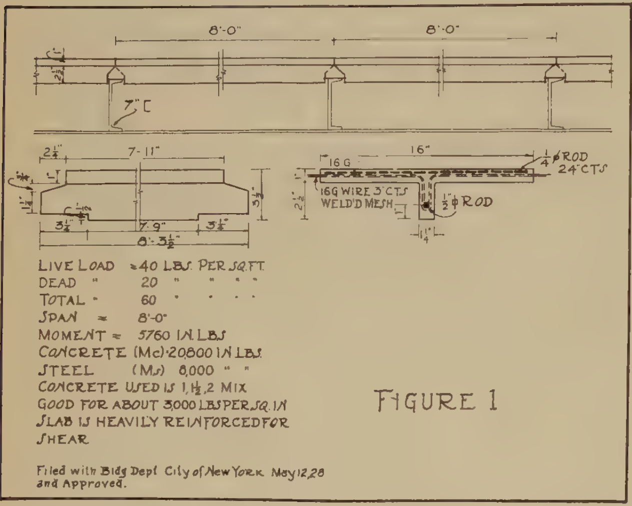
*The value of K has been given by Rankine as ½ for a square plate, whereas French engineers, as a result of recent tests, assign the value we have given 1/3. For the reader who may be interested in this problem we advise that he look into the subject of stresses in flat and circular plates. The entire question is beset with bristling difficulties at the present writing.

Concrete Unit Meets Need for Light-Weight Roofing

Concrete Units Replace Wood Sheathing in Re-Erection of Building—How Need for Light-Weight Roofing Was Met



LIVE LOAD = 40 LBS. PER SQ. FT.
DEAD " 20 " " " "
TOTAL " 60 " " " "
SPAN = 8'-0"
MOMENT = 5760 IN. LBS.
CONCRETE (Mc) 20800 IN. LBS.
STEEL (Ms) 8,000 " "
CONCRETE USED IS 1, 1½, 2 MIX
GOOD FOR ABOUT 3000 LBS PER SQ. IN.
SLAB IS HEAVILY REINFORCED FOR SHEAR

Filed with Bldg Dept City of New York May 12, 28 and Approved.

FIGURE 1

THE New York Coliseum, with a capacity of 28,000 people, is 250 ft. wide and 450 ft. long. It consists of a central portion 150 ft. wide and two wings, each 50 ft. wide. The middle section is covered with a curved roof supported by steel trusses 20 ft. apart, resting on steel columns. The extreme height is 70 ft. above the ground, and the span is 150 ft.

The building originally served as the administration headquarters at the Sesquicentennial Exposition in Philadelphia. It was dismantled by the Terry & Tench Company and, after making provision for raising the central portion 10 ft. in order to provide greater visibility, was re-erected by them in New York City at 177th Street, near Boston Road.

The original structure was covered with wood sheathing, and was, therefore, of light design. When the plans were filed with the New York City building department, the superintendent of buildings insisted that the roof be covered with a fireproof material and that provision be made for a roof-load of 40 lbs. per sq. ft. As a result, the net dead-load permitted for the fireproof covering was only 16 lbs. per sq. ft. The distance between purlins averaged about 8 ft. In order that the building requirements might be met, the T-shaped concrete unit known as Tee Stone was used. This is light-weight masonry requiring a minimum of mass.

The Tee Stone unit designed for this purpose was 16 in. wide, 3½ in. deep, had a 1-in. flange and a 1¼-in. stem. Its weight was placed at 15 lbs. per sq. ft.

Tee Stone fulfilled the requirements as to dead weight, strength and fireproof qualities; was approved by the New York City building department, and received the award as the lowest priced competing product.

It was found most economical to haul the units by truck the distance of 65 miles from the Terry & Tench plant at Marlborough, N. Y., to the site.

NEW BOOKS

Canadian Concrete Standards

STANDARD SPECIFICATION FOR CONCRETE AND REINFORCED CONCRETE. By the Canadian Engineering Standards Association, Ottawa, Canada.

This 150-page publication is the medium for the presentation of the specification prepared by an association committee. It is divided into three parts; the first is intended chiefly for the use of the constructor, and the second principally to guide the designer. Part 3 is comprised of a number of related specifications regarding materials, methods of test, etc.

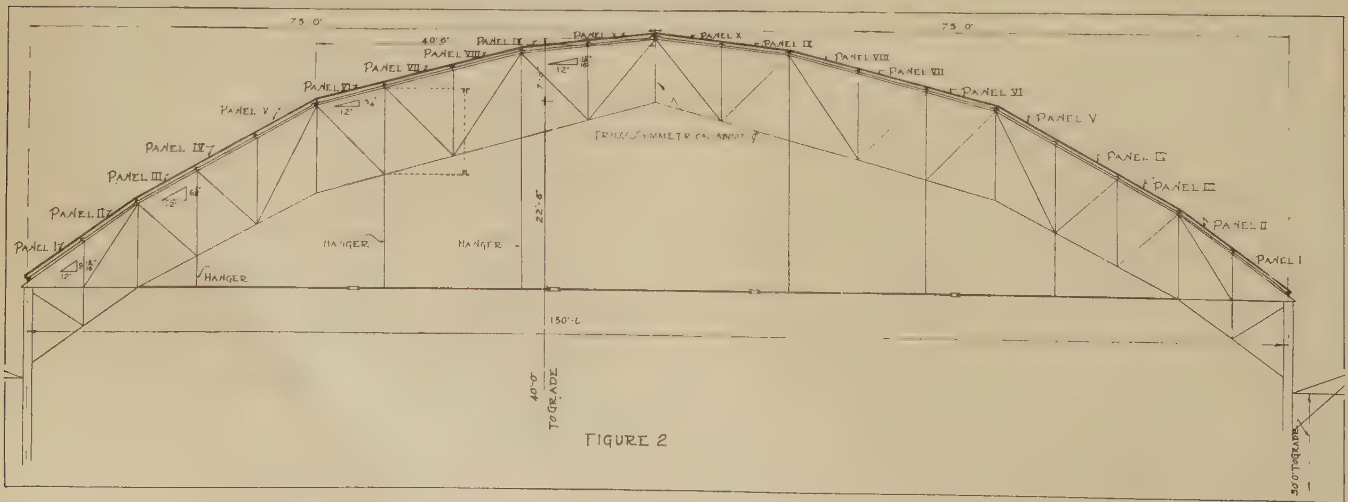


FIGURE 2

Are You Going to New Orleans?

Number of Papers at Meeting in Southern City to be Limited — Outline of Complete Program — Mississippi River Trip as Diversion — Banquet on Last Evening

THE subject of mixing and placing concrete occupies first place on the program of the 26th annual American Concrete Institute convention to be held at New Orleans, La., February 11th to 13th, both inclusive. Other subjects in the order in which they will come up are curing, concrete products, reinforced concrete building design, floor finish, and flood protection. An outline prepared by the institute, of the complete program, is given below.

As in other years, the institute meeting will be preceded by the convention of the National Concrete Products Association and by several important institute committee meetings, on Monday, February 10th. The Cast Stone Institute will meet on the evenings of the 11th and 12th.

To accommodate early arrivals, Concrete Institute registration will begin Monday morning, at the Roosevelt Hotel. The institute urges those attending to request fare-and-a-half certificates when purchasing railroad tickets for later validation at the A. C. I. registration desk.

Diversion on Father of Waters

The afternoon of Wednesday, February 12th, has been set aside for a trip on a Mississippi River steamer.

The institute dinner will be held at 7 p. m., Thursday, when three distinguished medalists will be honored, with a bit of New Orleans entertainment following.

Program of the American Concrete Institute Convention

Mixing and Placing Concrete. 2 p. m., Tuesday, Feb. 11

"*Construction Specification for Concrete Work on Ordinary Buildings*"—Reported by Committee 502, Mixing and Placing Concrete on Buildings, Arthur R. Lord, author-chairman. In leading the convention discussion Mr. Lord will be prepared for attacks on what some believe are radical specification requirements.

"*Construction Specification for Fabricating and Setting Reinforcing Steel*"—Reported by Committee 503, W. F. Zabriskie, author-chairman. Early in January the committee had yet to reach perfect accord. If the accord is reached in time the specification will appear in the February Journal, with addenda under the title "A Steel Setter's Primer." Mr. Zabriskie wrote it to reach with the fundamentals the man who actually places the steel and the latter looks like a valuable supplement to the specification proper.

"*Concreting Methods at Chute a Caron Dam*" (well up on the fringe of things on the Saguenay River), is a paper full of interest for every man designing and placing concrete. I. E. Burks, concrete technician for the Alcoa Power Co., is writing the paper. The institute's committee, 801, Durability of Concrete, A. E. Lindau, chairman, went up to see how Burks proposes to get durability—(a thousand yards of it a day) and found out; but prefers that Mr. Burks tell the story.

"*Specification for Centrally Mixed Concrete*," will be reported by Committee 504, Miles N. Clair, author-chairman. If we are going to buy our concrete by the truckload and have it dumped ready-to-use on the job, water-ratio and all, as thousands of yards are being bought, rules must be set up for a confirmed confidence in this new enterprise.

"*Design and Operation of Central Mixing Plants*," was the assignment of Committee 602, Frank I. Ginsberg, chairman. The committee's first report will be in brief papers by members of his committee who may be expected to answer Committee 504 by telling how a specification may be met readily by the rigidly controlled conditions of the central mixing plant.

After the Concrete is Mixed and Placed — Curing. 8 p. m., Tuesday, Feb. 11

"*The Effects of Variations in the Curing Conditions of Concrete*," by H. F. Gonnerman, manager, research laboratory, Portland Cement Association. The results of an extensive investigation.

"*Winter Concreting Methods*," reported by Committee 604, R. C. Johnson, author-chairman, as the basis of a "recommended practice." Discussion is looked for from members of the committee. New Orleans will provide ideal conditions for discussing sub-zero practice.

"*Variations in Standard Portland Cements*," reported in the November Journal by Committee 202, P. H. Bates, author-chairman, will be up for discussion.

"*Preliminary Studies of High Pressure Steam-Curing in the Manufacture of Concrete Masonry Units*," by P. M. Woodworth, assistant engineer, research laboratory, Portland Cement Association. Discussion will be led by Ray C. Kiser, manager, Crume Brick Co., Dayton, Ohio, in whose plant the investigation was made.

Concrete Products, 9:30 a. m., Wednesday, Feb. 12

"*A Study of Volume Changes in Concrete Masonry Walls*" (preliminary results of an important investigation), by W. D. M. Allan, manager, Cement Products Bureau, Portland Cement Association.

"*Recommended Practice for the Manufacture of Standard Concrete Masonry Units*"—a preliminary study by Committee 708, P. M. Woodworth, chairman, of a revised standard, based on modern practice and present knowledge of essentials.

"*Recommended Practice for the Use of Cast Stone*," reported by Committee 704, Louis A. Falco, chairman; presented for discussion and early publication in the Journal as proposed practice to be presented for tentative adoption in 1931.

"Color in Concrete Products," a summary of good practice, by Raymond Wilson, author-chairman, Committee 703.

"Plant Design for Single or Multiple Shift Operation," as reported by Benjamin Wilk, author-chairman Committee 707, and discussed by critic members of the committee. This report should provide an opening wedge for a general discussion of plant design and operating problems.

Reinforced Concrete Building Design—Floor Finish. 8 p. m., Wednesday, Feb. 12

"The Reinforced Concrete Column Investigation"—(Its possible influence on design) by Committee 105, W. A. Slater, chairman.

"Economics of Tall Building Design" reported by R. R. Zipprodt, author-chairman, Committee 405.

"Concrete in the New, New York Code" by P. A. Phillips, Turner Construction Co., New York.

"Deflections of Reinforced Concrete Members," a progress report by T. D. Mylrea, author-chairman, Committee 307.

"Good Practice in Finishing Floors" —reported by Committee 802, Portland Cement Floor Finish, John G. Ahlers, chairman, stereopticon views of floor cross sections showing the results of methods of finish and why some floors fail—presented with brief discussion by W. E. Hart, secretary of the committee.

Institute Business — Flood Protection. 1:30 p. m., Thursday, Feb. 13

"Business of the Institute" (including installation of new officers and directors).

"The President's Address," by E. D. Boyer.

"Design and Construction of the Bonnet Carre Spillway" (to divert Mississippi flood waters around New Orleans through Lake Pontchartrain) by Capt. Helmer Swenholt, Corps of Engineers, U. S. A.

"Making and Placing Concrete Revetment Mat" (for which interesting plant and procedure have been developed) by Lieut. Morris W. Gilland, Corps of Engineers, U. S. A.

"The Design of Gulf Shore Protection Structure," by J. B. Converse, consulting engineer, Mobile, Ala.

"Cementing Oil Wells," (far from being a fully developed and understood technique) will be the subject of a paper by J. E. Hough, Portland Cement Association. The Program Committee explored numerous likely sources of information on this subject—they all led back to Mr. Hough. He in turn makes the subject doubly interesting by intimating that it is still full of dark mystery with a very great deal still to learn.

Road Convention Reflects Hopeful Attitude on 1930 Prospects

The Twenty-Seventh Annual Convention and Exposition of the American Road Builders' Association, held in the Atlantic City Auditorium from January 13th to 17th, inclusive, marked another milestone in the progress of highway development.

While the attendance at the Atlantic City meeting has been exceeded at other meetings held in large population centers such as Cleveland or Chicago the buyers' interest was said to have been distinctly in excess of previous years. Contractors and other construction interests in general expressed a hopeful attitude toward the prospects for the coming year, since all indicators point toward an increase in highway construction programs. Less definite estimates are available on prospective street paving than on highway construction, but the limited data presented at one of the highway contractors' sessions indicated a slight increase in street work as compared with 1929.

The highway contractors' sessions held on Monday and Tuesday afternoons were devoted largely to papers and discussions dealing with the contractors' major difficulties, which continue to include such troublesome questions as liens in public construction, pre-qualification of bidders, inadequate investigation of irresponsible bidders by surety companies, bonus and penalty requirements, over-extension of credit to inexperienced contractors by equipment manufacturers, and related subjects. The various questions arising from competitive bidding by inexperienced and financially irresponsible concerns received more attention than any other single problem; but it may also be said that much progress was made during 1929 toward the reduction of the evils coming from this source. The discussion of this point was centered around a paper by S. M. Williams of the Associated General Contractors, Washington, D. C., dealing more specifically with the establishment of contractors' credit based on past performance.

Other papers of interest to highway and paving contractors dealt with the possibilities of airport construction and with highway construction in Latin American countries.

Wednesday was designated as Pan-American Day, when both morning and afternoon sessions included addresses, papers and discussions dealing with Latin American Highway programs, the solution of their special construction problems, and the political and economic aspects of the future road systems that are expected to connect the various countries. The American Road Builders' Association has made commendable progress toward the extension of its influence over the two continents.

In the equipment field the exhibits disclosed the development of many improvements during the past twelve months. There was a distinct increase in the number of trucks designed for the mixing of concrete in transit, several manufacturers having shown this form of equipment for the first time. Striking improvements appeared also in dump-truck equipment. Other improvements were noted in caterpillar tractors, trailer equipment, sand and gravel producing and quarry equipment, excavating equipment, pumps, material conveyors, snow-removing equipment, metal forms for concrete work, concrete form specialties, concrete curing and waterproofing specialties.

The equipment display covered both floors of the huge auditorium and overflowed into the ante-rooms, while some of the steam shovels and other excavating equipment were displayed outdoors, on the beach in front of the board walk.

Perhaps the most lasting impression that the observant visitor carried away from the road show exhibit was the mental picture of the vast sums that must have been expended by equipment manufacturers for the engineering talent, the experimentation and the tests that were back of the numerous improvements, each designed to cut a few cents off the unit cost price on some phase of construction work. The next most impressive feature of the exhibit was the further evidence of the increasing use of labor-saving equipment in this important branch of the construction industry.

Reinforced Concrete Design Simplified

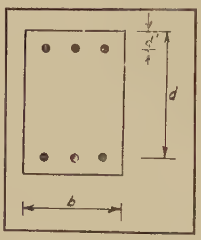
Chart G_1 (20,000; 0.40 f'_c)
Chart G_1 (20,000; 0.45 f'_c)

Unit Stress in Compression Steel—Beams Reinforced for Compression

American Concrete Institute Building Code

$f_s = 20{,}000$ lbs. per sq. in.
Without Special Anchorage of Longitudinal Steel
$f_c = 0.40\ f'_c$
$k = 0.375$

With Special Anchorage of Longitudinal Steel
$f_c = 0.45\ f'_c$
$k = 0.403$



BEAMS reinforced for compression are solved, as demonstrated in the original series, by the following steps:

(a) Determine the resisting moment of the given beam section for balanced tensile reinforcing.

(b) Determine unit stress in compression steel.

(c) Determine the necessary area of compression steel and additional tensile steel to carry the surplus moment over that carried by the balanced reinforcing.

Beam Design

When designing concrete beams reinforced for compression under the stress limitations of the A. C. I. Code, Charts A (20,000; 2000; 15) and A (20,000; 2500; 12) will solve step (a) depending upon whether 2000 or 2500 pound concrete is to be used. One of the two charts presented in this issue will solve step (b), depending upon whether or not special anchorage of longitudinal steel is to be used. Step (c) is solved by Chart H of the original series since it is applicable to all cases within the stress limitations shown.

Chart Application

In order to illustrate the use of the charts herein presented, and to compare results to be obtained by the use of different stress limitations, I am going to take the same conditions given in the illustrative problem solved in the December, 1928, issue. The conditions given were:

Simple span = 18 ft.
Live-load = 2500 lbs. per ft.
Overall beam dimensions = 16 by 24 in.
Tensile steel placed 2 in. above beam bottom.
Compression steel placed 2 in. below beam top.
$d = 22$ inches
$d' = 2$ inches
Total bending moment, $M = 1{,}430{,}000$ in. lbs.

The longitudinal steel required for the stress limitations of

$f_s = 18{,}000$ lbs. per sq. in.
$f_c = 2000$ lbs. per sq. in.
$n = 15$

was found to be

Total area of tensile steel = 4.12 sq. in.
Total area of compression steel = 1.98 sq. in.

Using the same beam section and steel location, I then have

Given:
$f_s = 20{,}000$ lbs. per sq. in.
$f'_c = 2{,}000$ lbs. per sq. in.
$f_c = 0.40\ f'_c = 800$ lbs. per sq. in.
$b = 16$ in.
$d = 22$ in.

From Chart A (20,000; 2,000; 15) obtain
$M_1 = 1{,}010{,}000$ in. lbs.
$A_{s1} = 2.64$ sq. in.

From Chart G_1 (20,000; 0.40 f'_c)
Given:
$d = 22$ in.
$d' = 2$ in.
Obtain,
$f'_s = 9080$ lbs. per sq. in. (comp. steel)

The surplus bending moment to be carried by the additional tensile steel and compression steel is then
$M_2 = M - M_1 = 1{,}430{,}000 - 1{,}010{,}000 = 420{,}000$ in. lbs.

From Chart H
Given:
$f_s = 20{,}000$ lbs. per sq. in. (tensile steel)
$f'_s = 9080$ lbs. per sq. in. (compression steel)
$d - d' = 22 - 2 = 20$ in.
$M_2 = 420{,}000$ in. lbs.
Obtain:
Additional tensile steel, $A_{s2} = 1.03$ sq. in.
Compression steel, $A'_s = 2.32$ sq. in.

Thus for the stresses
$f_s = 20{,}000$ lbs. per sq. in.
$f'_c = 2000$ lbs. per sq. in.
$f_c = 0.40\ f'_c = 800$ lbs. per sq. in.

I have obtained
Total tensile steel $= 2.64 + 1.03 = 3.67$ sq. in.
Total compression steel = 2.32 sq. in.

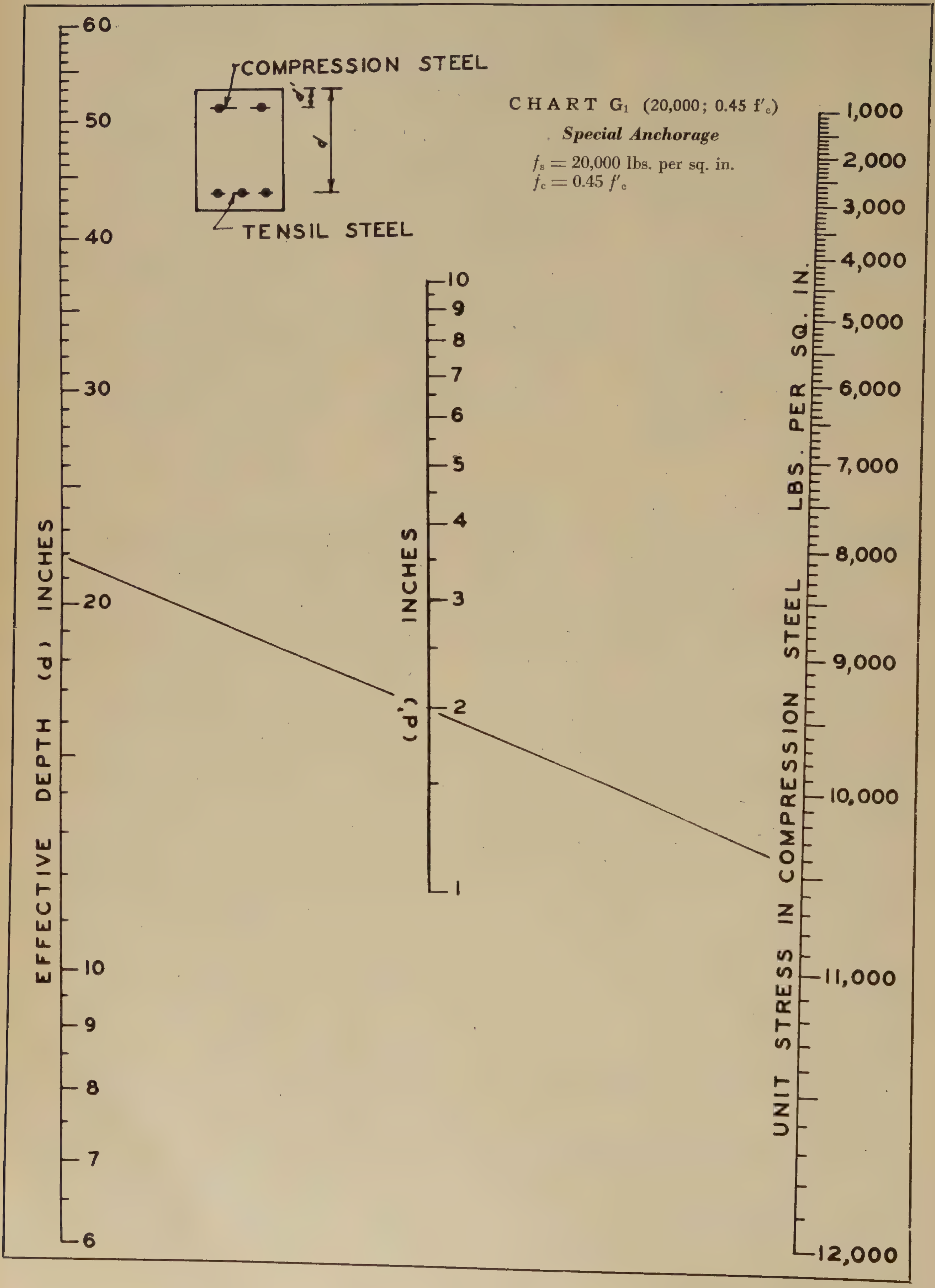


CHART G_1 (20,000; 0.45 f'_c)

Special Anchorage

$f_s = 20{,}000$ lbs. per sq. in.
$f_c = 0.45\ f'_c$

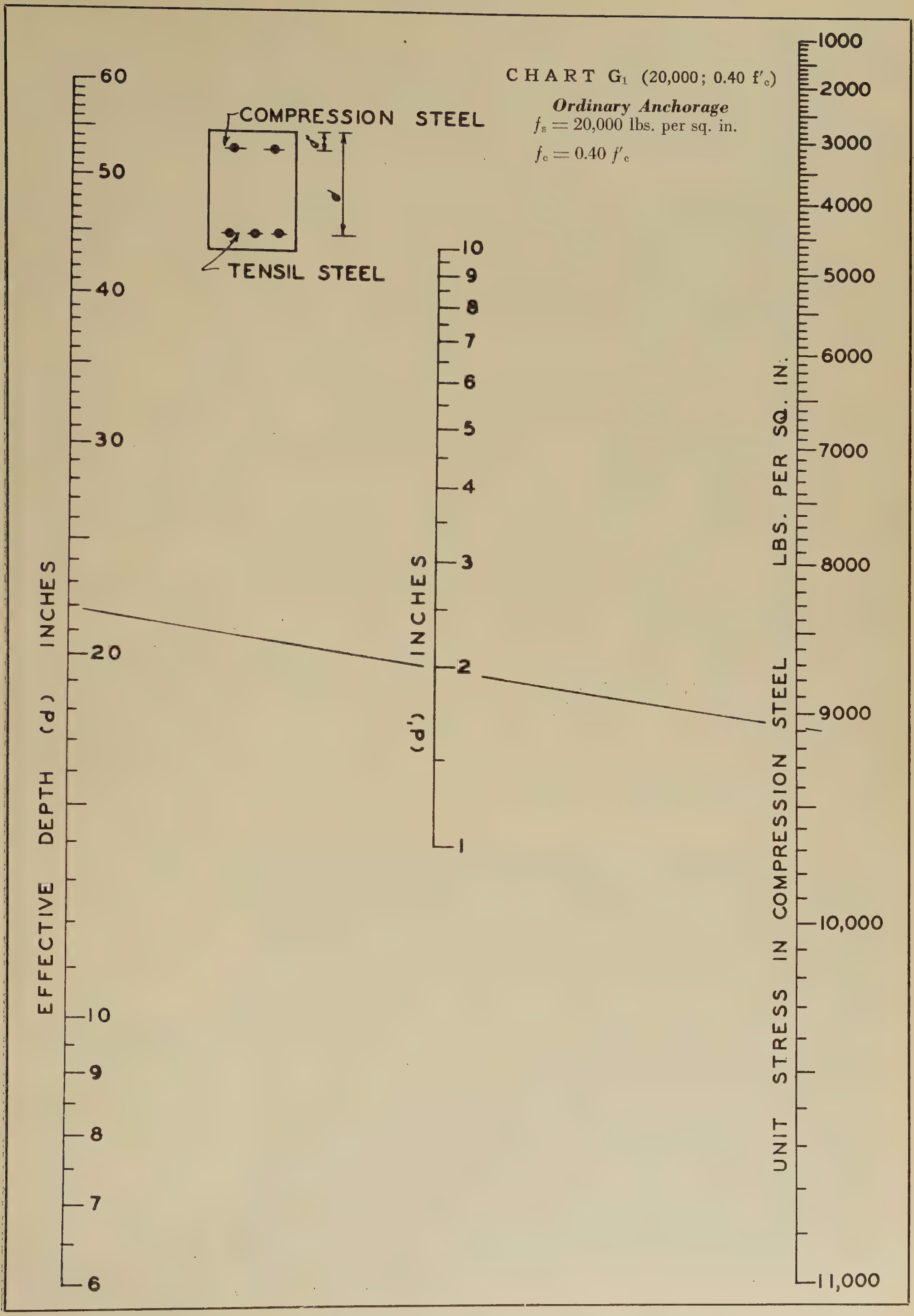


CHART G1 (20,000; 0.40 f'c)

Ordinary Anchorage

$f_s = 20{,}000$ lbs. per sq. in.

$f_c = 0.40\ f'_c$

It will be noted that for these particular stresses, in comparison to those used in the original problem, the area of tensile steel has been reduced but the compression steel has been increased in area required.

If 2500-lb. concrete, without special anchorage of the longitudinal steel, is used, the following results will be obtained:

$M_1 = 1{,}270{,}000$ in. lbs.
$A_{s1} = 3.32$ sq. in. (balanced tensile reinforcing)
$M_2 = M - M_1 = 1{,}430{,}000 - 1{,}270{,}000 = 160{,}000$ in. lbs.
$f'_s = 9080$ lbs. per sq. in. (compression steel)
$A_{s2} = 0.39$ sq. in. (additional tensile steel)
$A'_s = 0.90$ sq. in. (compression steel)
Total tensile reinforcement $= 3.32 + 0.39 = 3.71$ sq.in.
Compression reinforcement $= 0.90$ sq. in.

I have tabulated these results in Table 1-G_1, basing the percentage on that found in the original series.

TABLE 1-G_1

Quantity Comparisons of Steel Required in Beams Reinforced for Compression

		Tensile Steel		Compression Steel		Total Steel	
f_s	f_c	Area	Per Cent	Area	Per Cent	Area	Per Cent
18,000	800	4.12	100.0	1.98	100.0	6.10	100.0
20,000	800	3.67	89.1	2.32	117.1	5.99	98.0
20,000	1000	3.71	90.2	0.90	40.5	4.61	75.6

It will be seen from the above tabulation that in beams reinforced for compression, material saving in longitudinal steel can only be obtained by increasing the concrete stress along with that of the steel.

I have shown on Chart G_1 (20,000; 0.45 f'_c) a solution isopleth for the same values of (d) and (d') used in the illustrative problem. It will be noted that with special anchorage quite an increase of stress in the compression steel is permitted.

Chart Construction

In a manner similar to that used under Chart G of the original series, the following expressions were developed from Fig. 1-G_1:

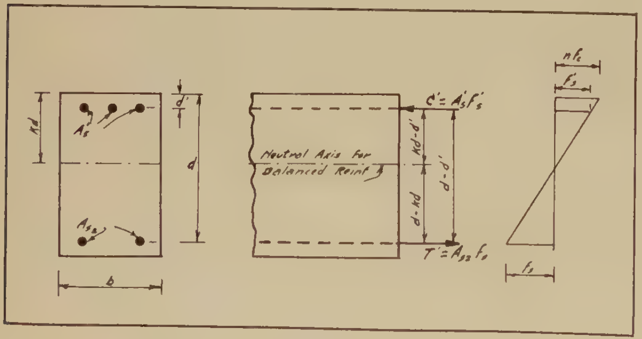


Fig. 1-G_1

For ordinary anchorage

$$\text{Given} \begin{cases} f_s = 20{,}000 \text{ lbs. per sq. in.} \\ f_c = 0.40\, f'_c \\ k = 0.375 \end{cases}$$

$$\text{Obtain, } d' = \frac{d\,(12{,}000 - f'_s)}{32{,}000} \qquad (1)$$

For special anchorage

$$\text{Given} \begin{cases} f_s = 20{,}000 \text{ lbs. per sq. in.} \\ f_c = 0.45\, f'_c \\ k = 0.403 \end{cases}$$

$$\text{Obtain, } d' = \frac{d\,(13{,}500 - f'_s)}{33{,}500} \qquad (2)$$

Except for numerical constants, expressions (1) and (2) are identical to the original expression derived. The nomographic characteristics will then be the same as found for the original Chart G:

$$n = \tfrac{1}{2}$$
$$m = 2$$

While the scale ratios are the same, I have, for convenience, changed the scales used. Fig. 2-G_1 gives the details by which the original of Chart G_1 (20,000; 0.40 f'_c) was constructed to solve expression (1). Likewise Fig. 3-G_1 gives the details by which the original of Chart G_1 (20,000; 0.45 f'_c) was constructed to solve expression (2).

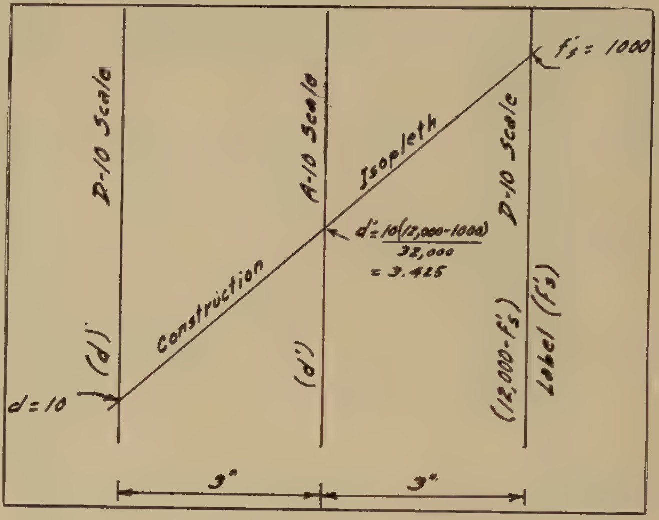


Fig. 2-G_1

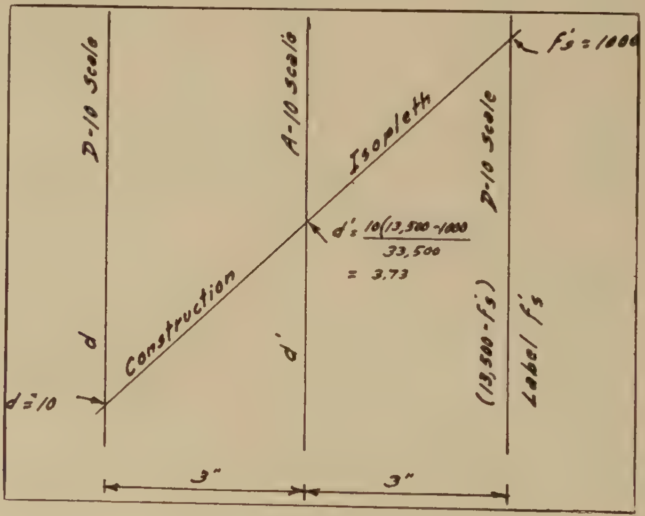


Fig. 3-G_1

Chart H of the original series, as previously explained, is applicable to the stress limitations herein considered so will not be reproduced.

Cast Stone Institute Extends Plans for Advertising

Response to its initial advertising in trade papers being encouraging, the Cast Stone Institute is planning additional advertising in consumer publications.

Concrete for the Builder

Making Basements Livable

Dry, Warm Basements Provide Desirable Home Comforts—Good Market for Services of Concrete Builders

ACCORDING to reports received from concrete builders and other reliable sources, one of the important trends in present-day residence construction is to make the basement livable. As a matter of fact, modern basements are being built so that they are dry and warm, thus offering many possibilities for increasing home comforts.

Basement Has Many Uses

Through the use of watertight concrete walls and floors, the builder can construct basements that are dry, bright, warm and comfortable. This builder can truthfully say that his work adds much to the value and utility of the house. Basement space has uses which are unlimited. Working and living conditions can be made equal to those in above grade interiors if recommended construction methods such as those given in the December article on "Basement Walls and Floors," are followed by the builder. Play rooms, dens, billiard rooms, workshops, music rooms —almost any type of room may be safely created in such a basement. The increasing tendency to make heating plants and service facilities clean, compact and attractive emphasizes the possibilities of the well-built basement as an added place for the real enjoyment of life.

Lighting and Decorative Finish

After well-built concrete floors and walls are in place, the builder can assure his customer that it is only necessary to provide adequate lighting and decorative finish to make living or working conditions in the basement comparable to those in above grade rooms.

The concrete builders who are taking advantage of the trend to make basements livable are impressing their prospects with the fact that the old-style basement is but little better than a dungeon—a dark, dank, unpleasant place, fit only for stores of household what-nots that could not very well be put in rooms above grade. Likewise, they are pointing out that in those sections where winter makes heating a problem, the old-style basement is merely a place for the heating plant, laundry tubs, fuel bins and catch-all storerooms. At best, a basement of this kind is satisfactory for keeping collections of old papers and clothes laid by to await the coming of the rag man, but it is not looked on as one of the livable parts of the house. Hence, with such a basement, a great deal of space goes to waste. Therefore, the progressive builders make an appeal to the home owner to eliminate this waste.

This basement is dry, bright, warm and comfortable and is used as a card and music room. The floor is watertight concrete, covered with concrete tile, and the foundation walls are also of concrete

All Houses Offer a Market

Whether the house is just being built or being modernized, there is a possibility of making use of the basement space. As has been indicated, the builder going after the foundation and basement floor work can convince the home owner that his basement can be made as dry, bright, warm and comfortable as any other part of the house. It is the foundation wall, between the footings and the grade line, that determines the dryness, the livability, of the basement. Naturally, if the basement is to be comfortable, the floor must also be dry. The concrete builder is equipped to build the right kind of basement walls and floors. Helpful hints are given in the article, "Basement Walls and Floors," and the builder's own experience will enable him to give full structural protection to the basement.

The interior finish and decoration of the basement are matters which can be handled in an infinite variety of manners, according to the taste of the home owner. In an accompanying photograph is shown a music room with the walls covered with textured portland cement stucco and the floor finish of concrete tile. Likewise, the concrete itself, carefully finished, makes an entirely comfortable and attractive floor. It may be stained, waxed and polished, or marked off in flagstone or tile designs—with altogether attractive results.

But the important thing for the concrete builder to do is to help rescue the basement from its status as a dungeon and to add it to the enjoyable, livable, useful parts of the house. There is a considerable market for concrete builders in this field. This is, indeed, a market worth selling.

One corner of this basement provides a children's playroom

Modernizing Increases Property Values

The home modernization movement offers an opportunity to beautify and develop residential communities. It also serves to attract other prospective home builders, thus increasing property values generally, with resultant benefits to the entire community. Modernizing any house is ultimately a community as well as a personal affair.

Ordinarily it is an easy matter to finance alterations, inside and out, because they usually increase the value of the house more than their cost. Here is what actually happened in Washington, D. C., when an old house was modernized. Although the mortgage company rated the house as absolutely valueless, the lot was appraised at $5,000. The company, however, extended loans up to $9,000 for carrying out the work of alteration. When the changes and additions were made the house and lot were valued at $14,000, and considered splendid security for the $9,000 loan. The company explained further that the property now has a cumulative value which will amount in the near future to $18,000—due entirely to the effect of the renovations. This is but one example; doubtless home owners in every community have had similar experiences.

Contractors Sell Sidewalks by Mail with Excellent Results

As a result of their first experience with direct-by-mail selling, C. B. and G. R. Vaughan, concrete contractors of Springfield, Massachusetts, are pleased with this method of lining up prospects.

Realizing that booklets on concrete sidewalks would pave the way for aggressive personal selling, the brothers mailed such publications to a select list of 70 home owners in Springfield. The first results were three sidewalk jobs that required no additional sales effort, and today the business is booming.

Government Tells How to Make Basements Dry

Remedial measures for wet basements and cellars are offered in Farmers' Bulletin No. 1572-F, "Making Cellars Dry," published by the U. S. Department of Agriculture.

In some cases, it states, wet cellars can be made dry by gravity drainage of the site and in other cases better ventilation will improve conditions.

A Concrete Tennis Court Job

Glen Ellyn, Illinois, Concrete Builder Constructs Five Courts in 11 Days

THE construction of concrete tennis courts, which have large areas of slab to be placed in a continuous operation, often appears to be too big a job for the contractor having modest equipment. However, Fred Brown, a concrete contractor of Glen Ellyn, Illinois, using a one-sack mixer, constructed five concrete courts for the Glen Ellyn park district in exactly eleven working days exclusive of the excavating work. It was not a case of luck; it was due to the simplified design of the court slabs and to well-planned execution of the work.

Simplified Design Reduces Cost

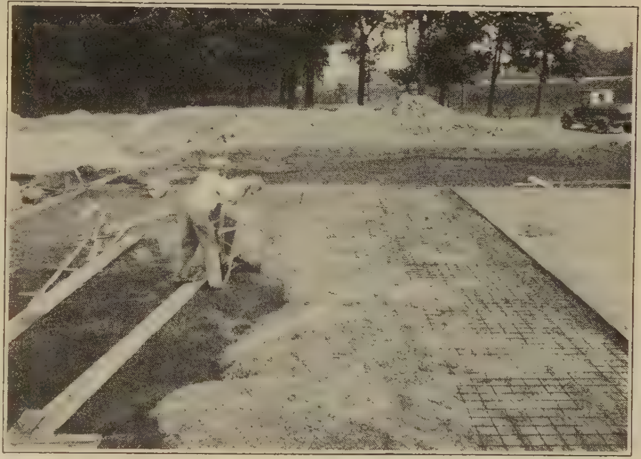
The contract was awarded Mr. Brown on a rebid. Due to a slight confusion in the original specifications, new bids were requested. Before returning the specifications to bidders, however, it was decided to simplify the design of the court slabs as well as to increase the strength. The construction was changed from two-course to one-course reinforced concrete. The strength of the slab was increased; first, by increasing the reinforcement 100 per cent, and, second, by increasing the strength of the concrete by 500 pounds per square inch through a water-cement ratio specification. Mr. Brown, who was not low bidder in the original bid, checked his figures carefully and found that the simplified re-design saved enough labor to offset the additional cost of the increased slab strength. He was awarded the contract.

Builder Uses Care

"The change from a two-course to a one-course job," said Mr. Brown, "saved me considerable time and even though we did not cut our mixing time off one minute, we never had to kill ourselves. These are the first courts I ever built, but I didn't have a bit of trouble." And he added that concrete tennis court work is not any more difficult than any other concrete work except that more care is necessary in planning the job.

One Course Construction Simple

Ordinarily, on a two-course job the time necessary to place and finish an entire court section (usually about 3,800 sq. ft.) of 5-inch reinforced concrete in a continuous operation is a job that contractors with modest equipment are afraid to tackle. One-course work, however, simplifies the work by reducing the time required for finishing and permitting one type of mix to be used throughout the entire job. In addition, the same aggregates are used throughout the entire construction.



Fred Brown's crew placing concrete and reinforcement for Glen Ellyn tennis courts

In this job, the lower 3 inches of concrete was placed and roughly leveled to permit placing of reinforcement. The color pigment was then added to the concrete for the top 2 inches which was then finished. Reinforcement consisted of paving mesh weighing 107 pounds per 100 sq. ft. The color pigment was red mineral oxide, three pounds per sack of cement being used to produce a pleasing shade of light red.

Controlled Concrete Used

Strict adherence to the water-cement ratio specification of not to exceed 6 gallons of mixing water per sack of cement, permitted the contractor to vary the workability to suit any job condition without reducing the strength specified. This also permitted earlier finishing of the concrete. The specification was disliked at first, as it was a reversal of concrete proportioning as usually practiced by the contractor. He accepted the drier concrete, but it did not seem just right to vary the aggregate proportions. However, by the time the job was finished, Mr. Brown was thoroughly acquainted with the water-cement ratio specification and heartily endorsed its use.

Excavation and Sub-base

It is interesting to note the ease and simplicity with which these courts were constructed. The subbase preparation included excavation to not less than 11 inches (as the soil was clay), a thoroughly compacted cinder fill 6 inches deep, and a line of drain tile under all sides, backfilled with crushed limestone. The excavating was done with a tractor excavator and the drainage line of concrete tile was laid with a pitch of approximately 6 inches per 100 feet.

In the right background concrete and reinforcement are being placed. Note screeding operation in left background. In the foreground, one man is trowelling and another is finishing with a broom having soft bristles

To speed up the entire job the forms were set and leveled and a liberal number of grade stakes were set in each section, each stake showing the depth of cinder fill required and the top of the stake indicating the finished grade required for the concrete slab. The stakes were pulled as fast as the top layer of concrete was screeded.

Concrete Placed in 12-ft. Strips

Concreting was done in 12-foot strips across the entire width of the court. The uncolored concrete was first placed to a depth of 3 inches on the base and leveled roughly for reinforcement location. As soon as a full width strip with the reinforcement was placed, the top 2 inches of colored concrete was added. In this way one finisher was able to start floating the concrete with a wooden float as soon as the topping was screeded. The screeding and floating not only leveled the concrete but compacted the surface to a greater density. Successive strips were then placed in time to prevent construction joints until an entire section, extending from one end to the expansion joint at the center, was completed.

Close-up of trowelling operation. Note broom finish in the foreground

Concrete tennis courts at Glen Ellyn, Ill., being cured by the ponding method

Finishing Is Important

The time and method of finishing were watched closely and care was taken so that the steel trowelling was done just after the concrete had hardened sufficiently to prevent fine particles from being brought to the surface. Trowelling was reduced to just the amount necessary to further compact the concrete and produce a smooth, dense surface. The finishers, when trowelling, pressed down with full force on their trowels.

After the sheen had appeared on the concrete surface, it was lightly brushed with a push broom having soft bristles. This brushing broke up the fine cement and sand film brought to the top by trowelling and produced a surface that, later, eliminated any possible sun glare or slipping during the play.

Continuous Curing

Continuous damp curing during the early stages of hardening aided in obtaining a hard, dense surface and in preventing checking and dusting due to the drying and shrinkage of the surface. The specifications required continuous damp curing for 7 days. On flat slab sections of this type, curing by ponding is much easier and so on the morning following the completion of concreting, each section was ponded by building small earth dikes and flooding the enclosed surface.

Tennis Court Market

The ready completion of this job shows that the average concrete contractor, although having only modest equipment, is able to do construction of this type. The market for tennis courts is large—clubs, parks and playgrounds, schools, hospitals, private home owners, all can be sold concrete work of this type. Low maintenance, many more playing hours, quicker drying surface, almost year-around use—all are good reasons why concrete tennis courts are popular.

Sold—$55,000 Worth of Concrete!

How Guy G. Noble, Concrete Builder of Tulare, California, Landed Contracts for Paved Yards and Other Construction at Sleepy Hollow Dairy Ranch

THERE is every reason to believe that Guy G. Noble of Tulare and San Luis Obispo, California, is an aggressive salesman of concrete work, the most important reason at present being his achievements at Sleepy Hollow Dairy Ranch, near Petaluma, California, one of the best equipped and efficiently managed certified dairies in existence.

Possibilities Foreseen

Not satisfied with obtaining an order to build four concrete stave silos for the owners of Sleepy Hollow Dairy Ranch at a contract price of $6,400, Mr. Noble was successful in convincing the owners that paved corrals and other concrete improvements would be invaluable at the ranch. When the various jobs were finished, including the four silos, Mr. Noble had done $55,000 worth of concrete work. A general idea of the extent of the work can be obtained by referring to the accompanying drawing which gives the location of buildings and arrangement of the concrete lanes and yards.

View of the concrete paved yards at Sleepy Hollow Dairy ranch

An interior view of the cow washing barn, Sleepy Hollow Dairy ranch, showing litter alley with concrete pavement

One of Mr. Noble's strongest selling points for paving the corrals with concrete was that this type of construction would help to maintain the yards in a strictly sanitary condition throughout the year, particularly in the rainy season. Incidentally, this dairy ranch contains 2,400 acres of land, part of which is below sea level, and the water in the bay is held back by dikes. Thus, cultivation of the fertile soil is made possible, while the ground remains extremely retentive of water; and the yards, unless paved, would be practically impassable during the rainy season.

Cleanliness with Concrete

As predicted by Mr. Noble, the paved lanes and corrals have been a big help in keeping the cows clean, which is essential in obtaining high quality certified milk. The concrete corrals are maintained in spotless condition in all seasons, manure being easily hauled out daily in a spreader. In this way, there is absolutely no loss of manure, as the concrete surface of the yards is impervious to moisture and non-absorptive. The corrals are sloped so that drainage is toward traps, the locations of which are shown on the accompanying drawing. The site of the ranch slopes gently from the milking barn toward the exercise corrals, allowing the rain to keep the concrete surface spotlessly clean. Mr. Noble also pointed out to his customers that concrete pavements would be advantageous during a dry season, because they eliminate dust which would ordinarily be churned up as the cows mill about the yards.

Pavement Specifications

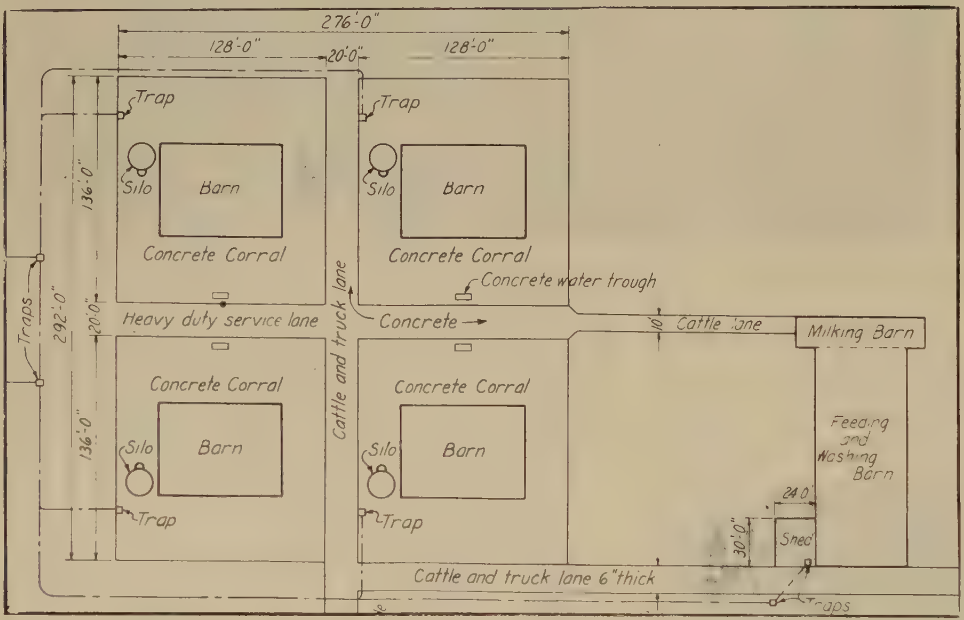
All of the pavement in the lanes at Sleepy Hollow Dairy Ranch is 6 inches thick, and of one-course construction, which means that the same mixture of concrete is used for the full thickness of the pavement. Mr. Noble reports that this pavement was finished with a 2 by 4 tamping bridge, except where a bad place would show up.

Sleepy Hollow Dairy ranch near Petaluma, California, where Guy G. Noble sold $55,000 worth of concrete work

In this case, the surface was floated or worked down until solid.

In the corrals, the pavements are 4 inches thick, and are also of one-course construction. The greater thickness of pavement in the lanes was necessary to obtain the increased strength that is required for hauling heavy truck loads of feed and silage over them. This paving was also finished under a 2 by 4 tamping bridge.

The surface of all paving is sufficiently rough to provide good footing for the dairy cows even when the concrete is wet, yet the finish is smooth enough to permit cleaning quickly and efficiently.



Plan showing location of buildings and silos and arrangement of concrete lanes and yards

Concrete paved corral and concrete floored feeding barn at Sleepy Hollow Dairy ranch

Mix Used in Paving

A concrete mixture consisting of 1 part portland cement to 2½ parts sand and 3½ parts gravel, with just enough water to obtain a plastic mixture that would place and finish well, was used in all of the paving work.

Other Work

In addition to building the four silos and paving the corrals and lanes with concrete, Mr. Noble did considerable other concrete work for the owners of the Sleepy Hollow Dairy Ranch. This work included an oil tank of 10,000 gallon capacity, placing of concrete floors in feeding sheds, calf barn, and milking barn, construction of numerous curbs, gutters, sidewalks and 21 concrete troughs for use in the corrals as well as in the pastures of the ranch.

Building Vaulted Concrete Sidewalks

Methods for Constructing Sidewalks Over Excavated Areas Adjacent to Buildings—How to Make, Place, Finish and Cure Durable Concrete

CONCRETE builders, especially those who do concrete work on sub-contract for large firms, frequently are called upon to build what are known as "vaulted concrete sidewalks." In fact, some concrete contractors are specializing in this kind of construction.

The chief reason for building vaulted sidewalks is to provide additional floor or storage space under sidewalks of commercial buildings. Such sidewalks serve two purposes in that they must also function as roofs. If reinforced concrete sidewalks are to meet efficiently the very severe conditions of service to which they will be subjected, they must be properly made, placed and cured.

The purpose of this article is to explain how concrete builders can make durable, watertight concrete for vaulted sidewalks. It discusses the definite requirements for such sidewalks, and how these requirements may be attained. Suitable information on materials, proportions, mixing, placing, finishing and curing is included which, if properly observed, will help the builder do satisfactory work. Accompanying drawings show typical vaulted sidewalk construction adjacent to common types of buildings. Detailed specifications for vaulted concrete sidewalks are available.

Important Requirements of Vaulted Sidewalks

Adequate service with freedom from repairs, freedom from structural and shrinkage cracks, absolute watertightness under all conditions, lack of dusting at the surface and satisfactory resistance to trucking and foot traffic are essential requirements of a vaulted concrete sidewalk. The builder must provide durable concrete if these requirements are to be met. Therefore, it must be remembered that the strength, durability and watertightness of concrete depend upon the ratio of the volume of mixing water to the volume of cement, providing the mixture is plastic and workable. In addition only clean, impervious, graded aggregates should be used, and these must be incorporated in a cement paste to produce a plastic, workable mass that can be placed without segregation. Correct finishing and adequate curing are equally important.

Aggregates Most Suitable for Use

Aggregates (sand and gravel or crushed stone) of good quality and of graded sizes are preferable; they help in producing plasticity. Sand should consist largely of coarse grains ranging from 1/16 to ¼ in. Material finer than 50 mesh should be avoided because it tends to rise to the top during troweling, resulting in a finish that easily wears away under hard service. Coarse aggregate (gravel or crushed stone) should be graded from ¼ in. to the maximum size suitable to the type of construction. For beams, columns, girders and base slabs, the maximum size of the coarse aggregate should be one inch; for the wearing course, ⅜ in., with all particles passing a ½-in. mesh. Coarse, hard grains near the wearing surface will help to prevent shrinkage cracks (crazing), and increase the resistance to action of foot traffic and trucking.

Water-Cement Ratio

Concrete for the structural parts of vaulted sidewalks should contain not more than 6 gallons of water per sack of cement; for the wearing course, only 4 gallons of water per sack of cement. The mixing water should be measured accurately, as any increase in the amount of water over that specified will result in a corresponding decrease in strength and durability. Allowance must be made for free water in the aggregates. This moisture must be accurately determined and an equivalent amount subtracted from the specified quantity of mixing water.

A mix proportioned approximately 1:2:3 will be required for the substructure and base slab, with graded aggregates up to 1 in. and with mixing water limited to 6 gallons for each sack of cement.

Experience has shown that the proportion 1:1:2, using ⅜-in. aggregate, with not more than 4 gallons of mixing water per sack of cement, is satisfactory for the wearing course. If objection is raised to the use of ⅜-in. aggregate, a fair trial will soon convince the finishers that the mix will work satisfactorily under the trowel.

The foregoing proportions are used as trial mixtures and may need modifications to obtain the required workability. Workable concrete requires enough cement-water paste to surround completely each aggregate particle. A mixture plastic enough to be compacted with little spading but without causing segregation or excess water to rise to the surface is the most satisfactory. If the trial mixtures lack the required workability, adjust the proportions of fine and coarse aggregate within the range of 1:1:2 to 1:1:1. The specified water-cement ratio should not be increased in making these changes to attain workability; on the other hand, changes of the proportions of fine and coarse aggregates may make it possible to reduce the ratio.

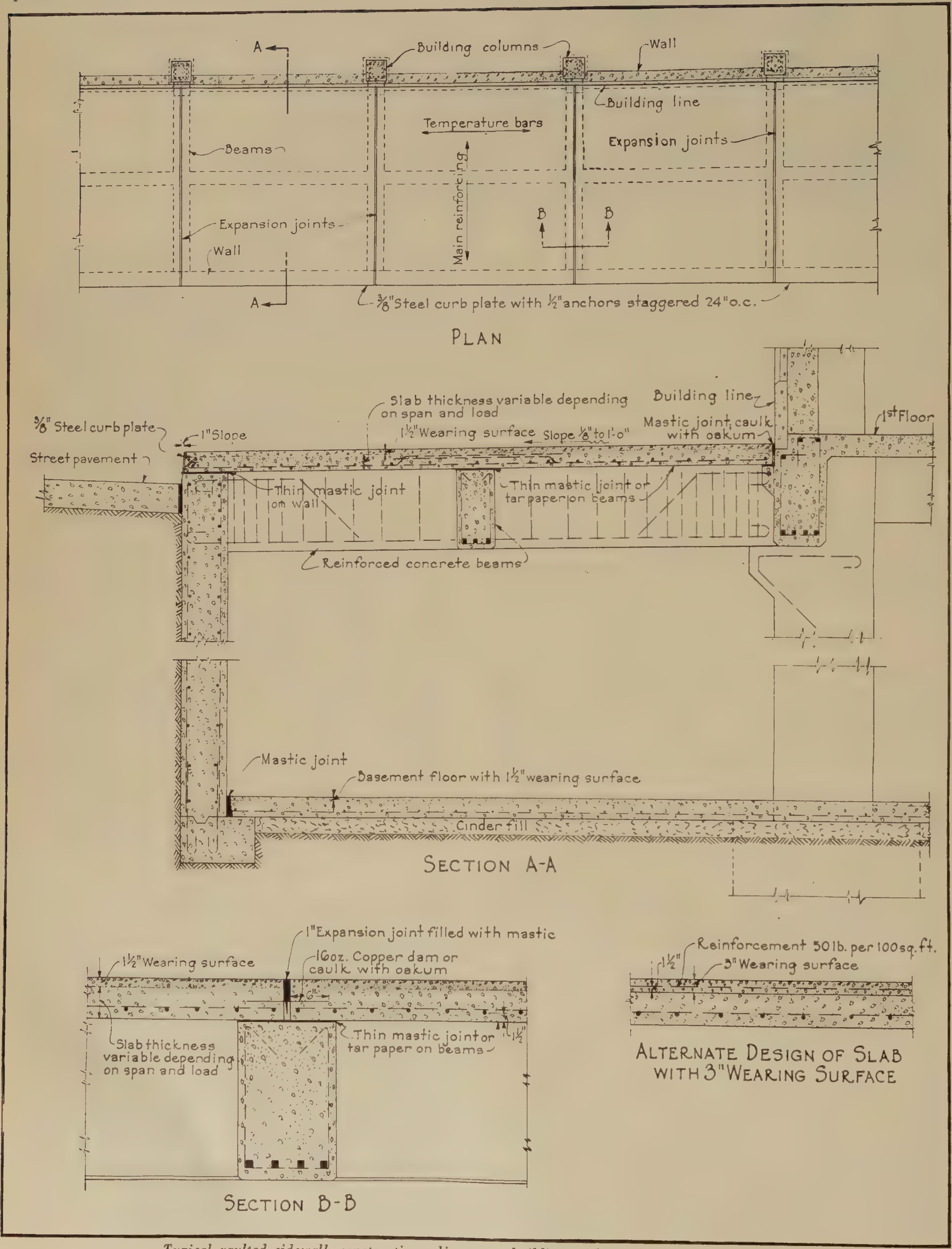
Placing and Finishing

Placing and finishing of concrete for vaulted sidewalks is done in two separate operations. First, the substructure and base slab are placed and brought to grade, after which the wearing course or topping is deposited.

Concrete for the structural parts of the sidewalk, columns, beams, girders and base slabs, is placed carefully so as to fill all corners of the forms and completely surround all reinforcement. Placing should be continuous and done in such a way as to maintain surfaces approximately horizontal throughout the entire operation up to the top level of the base slab. This means that the concrete must be deposited at several different locations to avoid pyramiding and the resulting flow to distant corners of the forms. Concrete flowing over long distance will cause the ingredients to separate, resulting in weak or honey-combed areas. For inaccessible places, where spading is not practicable, compacting of the concrete may be assisted by lightly striking the forms.

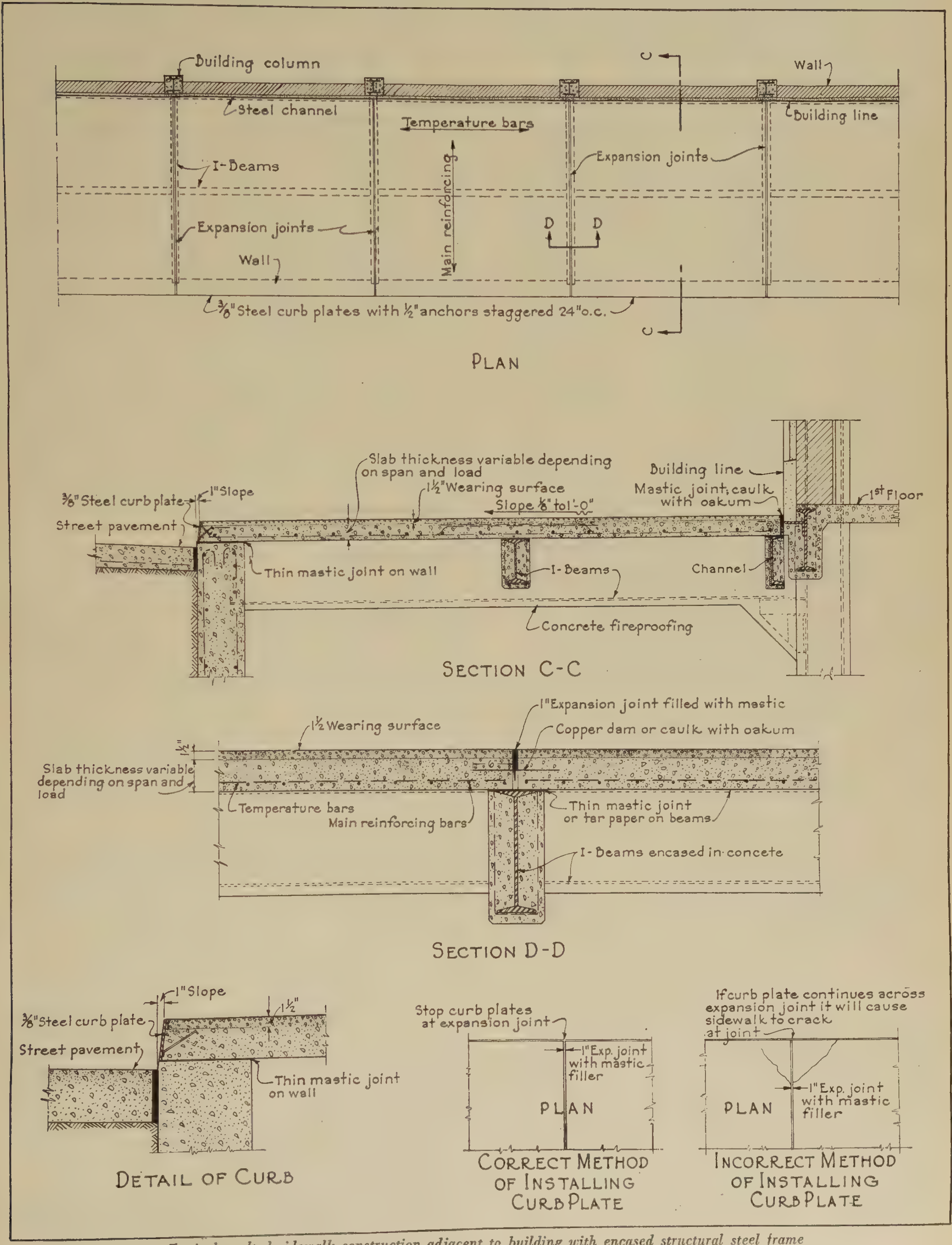
The wearing course may be placed while the base is still plastic, or after it has hardened.

When the wearing course is to be placed after the base has hardened, the base is struck off evenly from 3 to 4 in. below the finished sidewalk grade and floated. Special bonding treatment is not needed when the topping is to be


A
Building columns
Wall
Building line
Temperature bars
Expansion joints
Beams
Main reinforcing
B
B
Expansion joints
Wall
A
3/8" Steel curb plate with 1/2" anchors staggered 24" o.c.
PLAN
Slab thickness variable depending on span and load
Building line
3/8" Steel curb plate
1" Slope
1 1/2" Wearing surface
Slope 1/8" to 1'-0"
Mastic joint, caulk with oakum
1st Floor
Street pavement
Thin mastic joint on wall
Thin mastic joint or tar paper on beams
Reinforced concrete beams
Mastic joint
Basement floor with 1 1/2" wearing surface
Cinder fill
SECTION A-A
1" Expansion joint filled with mastic
1 1/2" Wearing surface
16 oz. Copper dam or caulk with oakum
6"
Slab thickness variable depending on span and load
Thin mastic joint or tar paper on beams
1 1/2"
SECTION B-B
Reinforcement 50 lb. per 100 sq. ft.
1 1/2"
3" Wearing surface
ALTERNATE DESIGN OF SLAB WITH 3" WEARING SURFACE

Typical vaulted sidewalk construction adjacent to building with reinforced concrete frame

3 or more inches thick. This method is the most satisfactory. There is practically no danger of absorbing water from the base, as when the monolithic method is employed. It is easier to attain the correct grades, finishing operations may be done more rapidly and efficiently, and less protection is required for the finished surface because most of the building will have been completed by the time the separate topping is applied.


Building column
Steel channel
Temperature bars
Wall
Building line
I-Beams
Main reinforcing
Expansion joints
Expansion joints
D
D
C
C
Wall
⅜" Steel curb plates with ½" anchors staggered 24" o.c.
PLAN
Slab thickness variable depending on span and load
1½" Wearing surface
Slope ⅛" to 1'-0"
Building line
Mastic joint, caulk with oakum
1st Floor
⅜" Steel curb plate
1" Slope
Street pavement
Thin mastic joint on wall
I-Beams
Channel
Concrete fireproofing
SECTION C-C
1" Expansion joint filled with mastic
Copper dam or caulk with oakum
1½ Wearing surface
Slab thickness variable depending on span and load
Temperature bars
Main reinforcing bars
Thin mastic joint or tar paper on beams
I-Beams encased in concete
SECTION D-D
1" Slope
1½"
⅜" Steel curb plate
Street pavement
Thin mastic joint on wall
DETAIL OF CURB
Stop curb plates at expansion joint
1" Exp. joint with mastic filler
PLAN
CORRECT METHOD OF INSTALLING CURB PLATE
If curb plate continues across expansion joint it will cause sidewalk to crack at joint
PLAN
1" Exp. joint with mastic filler
INCORRECT METHOD OF INSTALLING CURB PLATE

Typical vaulted sidewalk construction adjacent to building with encased structural steel frame

When the wearing course is applied monolithically, that is, when it is to be bonded to the base, the latter is struck off 1½ in. below the finished sidewalk level. Free water on the surface of the base course should be removed, as otherwise it will be absorbed by the topping, thus reducing the strength of the wearing course. The topping should be placed before the base has hardened appreciably in order to secure good bond. The sooner the topping is placed the better.

Due to the limitation of mixing water and the size of coarse aggregate, the finish course when first deposited will have a somewhat open structure. Particular care must be taken to compact the concrete by screeding, floating and troweling to secure a dense, impermeable finish. Screeding is done by moving a straight-edge over the surface of the concrete with a saw-like motion until the freshly placed concrete is struck off accurately to the correct level. Tearing of the surface should be avoided and the full compacting action of the screeding operation utilized. Floating, which removes most of the bumps and hollows left by the straight-edge, is done by rubbing the surface with a wood or cork float. After floating, the concrete is troweled. To secure best results, troweling should be done at a time and in such a way as to avoid the formation of a weak film at the top. The first troweling should be light. After the concrete has stiffened sufficiently to prevent upward movement of fine particles, further troweling, with pressure, will improve the density of the concrete. The greater the pressure exerted on the trowel, the greater the density of the wearing course. However, excessive troweling should be avoided.

Curing Vaulted Concrete Sidewalks

Even though all operations of mixing, placing and finishing have been carefully done, failure to cure properly may lessen the durability of the sidewalk under service. Applying water to the surface of the concrete as soon as it is hard enough not to be marred, permits the concrete to harden uniformly and prevent shrinkage cracks or crazing. If allowed to dry during the hardening period, the concrete contracts much faster at the surface than below, and regardless of temperature reinforcement it may develop hair-like cracks. These allow the entry of rain or melted snow, and encourage disintegration due to freezing.

There are several curing methods. Ponding, sprinkling, covering with wet sand or wet burlap will each give good results. The ponding method is most effective in this case and may be used where earth is available for constructing small dikes. The concrete slab is surrounded by these dikes and the enclosure kept filled with water. Covering materials should be kept continually wet by frequent sprinkling. The curing period should be not less than 10 days, and even longer curing will result in a more satisfactory sidewalk. In terms of expense, curing is the least costly of any construction operation, and is the most beneficial.

Sidewalks constructed at the time a building is erected offer no problem in being satisfactorily cured. The construction is usually enclosed and the traffic routed around the site for a much longer time than 10 days. During this interval water may be continually applied to the finished surface. When sidewalks are constructed independently of the building, a temporary walkway of wood planking on a 2 or 3-in. sand cushion may be laid over the new concrete as soon as it has hardened sufficiently to withstand the load. The sand cushion may be kept continually wet at little cost and no inconvenience to pedestrians.

Coarse Grained Finish

In certain locations a non-slip finish is desired. This may be secured by roughening the finished surface with a hair or straw broom after the final troweling, or by the use of non-slip aggregate. Non-slip aggregates may be mixed with the concrete wearing course or sprinkled on the surface just prior to finishing. When mixed with the concrete a greater amount of the aggregate is required, but a more uniform distribution is attained; ¾ to 1 lb. of non-slip aggregate is required to each square foot of finished surface. When applied only to the surface, from ¼ to ½ of a pound of abrasive is used. The material should be uniformly scattered over the topping just prior to floating and troweling. This method places the non-slip aggregate only at the surface, where it is needed.

Joints in Vaulted Sidewalks

Joints that will allow the free and independent movement of unit parts of the sidewalk slab in order to prevent the formation of structural cracks are required. The spacing and width of joints will depend upon the range of temperature, type of construction and amount of reinforcing steel. Joints should be vertical to the wearing surface, should extend for the full width and depth of the slab, and should be made watertight. This may be accomplished by using sheet copper expansion dams as shown in the accompanying drawings. The space above the dams is filled with a satisfactory bituminous material. Where a metal dam is not used, and particularly where the joint comes over a beam or other support, the most satisfactory joint is made by tightly ramming oakum into the opening and then topping it off with an approved asphaltic material. To maintain watertightness, the asphaltic filler should be renewed from time to time as conditions may warrant.

Sidewalk Lights

Daylight illumination is sometimes desirable in areas under sidewalks. Where this is required, reinforced concrete panels containing glass prisms are installed. These slabs are generally precast, though not always. Care should be observed to insure a permanently leak-proof construction. The glass prisms should be protected from expansion stresses. A satisfactory method consists in sealing the glass prisms in rustproof metallic holders, which are set in the concrete and become thoroughly bonded to it. Concrete of the same quality as the topping and of an easily workable consistency should be used, so that it will readily work around the metal shields and the reinforcement to produce a strong and watertight unit. Non-slip aggregates in the concrete around the prisms are advisable because the glass is somewhat slippery during wet weather. To provide a watertight joint around the panels, they should be embedded at least 3 in. in a portland cement grout. The vertical joint is made tight in a manner similar to that employed in expansion joints.

Membrane Waterproofing

Concrete, when properly designed, placed, finished and cured in accordance with the suggestions given here, should be watertight and durable. If these suggestions are followed there will be no need of a waterproofing membrane between the base and the finish course. If for any reason it is desired to include a waterproof membrane, this should be of an approved type and placed on the surface of the hardened base slab. The wearing course should in this case be at least 3 in. thick, made and placed in the same manner as previously described for a 1½-in. wearing course without membrane.

Colored Sidewalk Finishes

When a sidewalk having a tint other than the normal gray is desired, mineral coloring pigment may be mixed with the concrete for the topping. This should be resorted to on the job only when prepared machine-mixed materials are not available in the desired colors. Manufacturers' specifications should be carefully followed. Use only those coloring materials that experience has shown to be resistant to weather.

Precautions and Repairs

The most common defect noticed in concrete sidewalk finish is crazing or surface checking. If the suggestions on proportioning, placing, finishing and curing made in this article are followed, crazing or surface checking will be greatly reduced or entirely eliminated. Particular attention should be taken to avoid the formation of a layer of cement mortar at the surface.

Structural cracks in sidewalks originate from faulty design, settlement, absence of expansion joints or overloading. Water soon finds its way through such cracks, so that repairs should promptly be made. Satisfactory results may often be obtained by chipping out the crack to a sufficient depth and width to permit caulking with oakum and topping off with a suitable plastic joint filler.

Particular attention should be paid to the installation of steel curb plates or angles to avoid formation of cracks in the sidewalk slab. Curb plates should not be continuous over expansion joints, but should be provided with corresponding joints so that the concrete is free to move on either side. Fig. 2 illustrates correct and incorrect ways of installing curb plates at expansion joints.

In the case of defective finish, chipping off of the entire surface will be required. In no case should the depth of chipping be less than 1½ in. Feathered edges should be avoided and the full depth of the chipped area should be maintained up to the point where it joins with the sound finish. The chipped area should be swept clean, and the surface wetted and grouted with neat cement paste, care being taken to avoid the formation of pools of water. Immediately after grouting, the wearing course should be applied in accordance with suggestions already given for new work. Patches should be protected against use until they have been thoroughly cured.

February Contractors' Conferences in Middle West, East, South and Far West

Contractors who do monolithic concrete work exclusive of pavements or large buildings are invited to attend conferences scheduled in 12 states and the District of Columbia during February. The complete list of 28 meetings is given below.

The Portland Cement Association, in conducting these conferences, is helping concrete contractors to increase their present business through enlarging existing markets and developing new markets. Thirty-five such conferences were held up to and including January 18, with a total attendance of 1,064—705 concrete contractors, 212 building material dealers and 147 other interested persons. Sixteen other meetings were also scheduled subsequent to January 18.

Probably the most outstanding result of meetings held to date is the interest concrete contractors are showing in the development of definite sales campaigns. Many of them are planning to hire salesmen to help increase their concrete business. One man has made a definite program for 1930, the goal being to sell at least 30 concrete swimming pools. He has already sold three! Others are realizing that there is an enormous market for reinforced concrete floors for residences and, accordingly, are equipping themselves to do this kind of concrete work.

During February meetings will be held in Virginia, New York state, West Virginia, Pennsylvania, Tennessee, Arkansas, Iowa, Mississippi, District of Columbia, Louisiana, Massachusetts, Maryland and California, according to the following schedule:

Virginia

Norfolk, Feb. 3, Real Estate Exchange in Monticello Arcade Bldg.
Richmond, Feb. 5, Builders Exchange, 6th and Franklin Streets.

New York

Binghamton, Feb. 4, Binghamton Public Library.
Elmira, Feb. 6, City Hall.
Buffalo, Feb. 17, Builders Exchange.
Rochester, Feb. 19, Builders Exchange.
Syracuse, Feb. 21, Hotel Onandaga.
Albany, Feb. 24, Municipal Gas Building Auditorium.

West Virginia

Charleston, Feb. 7, Kanawha Hotel.

Pennsylvania

Pittsburgh, Feb. 4, William Penn Hotel.
Harrisburg, Feb. 17, Penn-Harris Hotel.
Lancaster, Feb. 19, J. H. Meyers & Co., Auction Room.
Reading, Feb. 20, Builders Exchange.

Tennessee

Memphis, Feb. 17, New Technical High School.

Arkansas

Little Rock, Feb. 18, City Hall, Council Chamber.

Iowa

Davenport, Feb. 18 (See Building Material Dealer).
Des Moines, Feb. 24 (See Building Material Dealer).
Sioux City, Feb. 26 (See Building Material Dealer).

Mississippi

Jackson, Feb. 25, Walthall Hotel.

District of Columbia

Washington, Feb. 24, Raleigh Hotel.

Louisiana

Shreveport, Feb. 21, City Hall Auditorium.
New Orleans, Feb. 28, Roosevelt Hotel.

Massachusetts

Springfield, Feb. 26, Vocational School.
Worcester, Feb. 28,* Mechanical Engineering Bldg., Worcester Polytechnic Institute.

Maryland

Baltimore, Feb. 27, Engineers Club.

California

Los Angeles, Feb. 21 (See Building Material Dealer).
San Diego, Feb. 25 (See Building Material Dealer).
Santa Barbara, Feb. 28 (See Building Material Dealer).

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*Meeting at Worcester will be held at 2:30 p. m.; all other meetings in February at 7:30 p. m.

Need for Basements

One of the first considerations in modernizing most old houses is the basement. In many old dwellings there are no cellars. The foundations are shallow. The first steps in modernizing such structures are usually the rebuilding of foundations, together with sufficient excavation to provide a useful basement, and the building of a concrete basement floor. In most parts of the country, the basement is important. It affords the logical place for the heating plant and other service facilities. And when the basement is made dry and livable by the use of watertight concrete walls and floors, it adds much to the value of the house.

The Concrete Industry —25 YEARS AGO

UNDER the title "Reinforced Concrete Mill Construction," CONCRETE for February, 1905, describes the design and construction of a Chicago factory as follows: "This building covers about 10,000 sq. ft. and is now four stories, but two more stories will be added. The outside walls are of brick, 30 in. thick. The columns, girders and floor, and the interior walls and stairways are of reinforced concrete. The mixture used is 1:3:5, washed torpedo sand, and crushed gravel, the gravel running one-half inch to one inch. The materials are brought in wagons and dumped in sunk hoppers near one of the walls. A mixer in the basement, operated by a gasoline engine, takes in the materials through an automatic feed, and the mixed concrete is dumped in wheelbarrows which are sent up an elevator to the floor under way."

Continuing, "The concrete columns are 26 in. in diameter in the basement and first story, and 24 in. in the upper stories. Four vertical steel rods are used in each column $1\frac{1}{4}$ in. in diameter, and at intervals of two inches in the height of the column, about an inch from the surface, are three-eighths inch steel rings. The girders are 14 by 12 in., and they are reinforced in a peculiar manner, to obtain a cantilever effect on the supporting columns. Four flat bars are used in each girder, $\frac{1}{2}$ by $2\frac{1}{2}$ in. Two of these bars are arched over the column, rising near the top of the beam, with the ends extending downwards like a drawn bow into the beams at a distance of five feet, where they are held by pin anchors."

The first meeting of the National Association of Cement Users, held at Indianapolis, Indiana, January 17th to 19th was reported to have been a enthusiastic and successful one. Six hundred were in attendance and a great deal of valuable information and benefit obtained, CONCRETE states. "A remarkable amount of enthusiasm was manifested which extended not only to the convention hall but to private discussion upon various subjects at other times. Each one seemed possessed with a strong desire to learn as much as possible about the different branches of the work." Eight years later the Association became the present American Concrete Institute.

Most failures of buildings under construction, says *Cement Age* for February, 1905, have been due to absolute overloading with a constantly increasing accumulation of materials of construction.

An illustration shows cement bags piled up 10 and 12 bags high at one end of a floor in a Long Island warehouse.

"This accidental load when figured out shows a load of 750 lbs. per sq. ft. Inasmuch as the floor and structural frame were designed for a working load of 120 lbs. per sq. ft., with a factor of safety of four, it can be seen that this accidental test at the time when the floor was still green rather seriously tried the concrete construction.

"There was an average deflection of the floor under the above load of $\frac{3}{4}$ in., all of which was regained on removal of the loading, showing that the elastic limit had not been reached."

Organizations

American Concrete Institute; Harvey Whipple, Secretary, 2970 West Grand Blvd., Detroit, Michigan.
Annual convention, February 11th, 12th and 13th, Roosevelt Hotel, New Orleans, La.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 W. Grand Ave., Chicago.

American Construction Council; Dwight L. Hoopingarner, Executive, 28 W. 44th St., New York City.

American Engineering Standards Committee; Dr. P. G. Agnew, Secretary, 29 W. Thirty-ninth St., New York City.

American Road Builders' Association; Miss E. A. Birchland, Secretary, 29 W. Thirty-ninth St., New York City.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 W. Thirty-ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa.

Associated General Contractors of America; D. H. Sawyer, Secretary, 1150 Munsey Bldg., Washington, D. C.

Cast Stone Institute; Frank M. Brooks, Secretary, P. O. Box 417, Pasadena, Calif.
Annual meeting, February 11th and 12th, Roosevelt Hotel, New Orleans, La.

Building Officials Conference of America; Col. John W. Oehmann, Secretary, 1253 Lawrence St., N. E., Washington, D. C.

Concrete Reinforcing Steel Institute; M. A. Beeman, Secretary, Tribune Tower, Chicago.
Sixth annual meeting, March 31st to April 2nd, Bon-Air Vanderbilt Hotel, Augusta, Ga.

Iowa Concrete Products Association; R. L. Gavin, Secretary-Treasurer, 1002 Hubbell Bldg., Des Moines, Iowa.
Annual meeting, February 19th and 20th, Des Moines.

National Association of Builders' Exchanges; Earl F. Stokes, Secretary, 15 E. Fayette St., Baltimore, Md.

National Concrete Products Association; A. G. Swanson, Secretary, Omaha, Nebr.
Annual meeting, February 10th, Hotel Roosevelt, New Orleans, La.

National Crushed Stone Association; J. R. Boyd, Secretary, 751 Earle Building, Washington, D. C.
Annual convention, January 20th to 22nd, Hotel Gibson, Cincinnati, Ohio.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

National Lime Association; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N.W., Washington, D. C.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 432 Munsey Building, Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 937 Leader Building, Cleveland, Ohio.

Northwest Concrete Products Association; W. P. Hews, Yakima, Wash.

Ohio Concrete Products Association; G. M. Friel, Secretary-Treasurer, 2284 North High St., Columbus, Ohio.

Portland Cement Association; William M. Kinney, General Manager, 33 W. Grand Ave., Chicago.

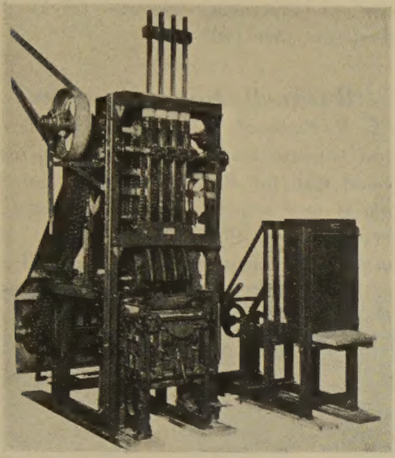
Rail Steel Bar Association; H. P. Bigler, Engineering Secretary, Builders' Building, 228 N. La Salle St., Chicago, Ill.

Wisconsin Concrete Products Association; Jack Franklin, Secretary-Treasurer, 3115 Plankinton Arcade, Milwaukee, Wisconsin.

New Equipment and Materials

Automatic Machine Spreads Facing Over Pallet

To overcome the difficulty of handling block facing material by spreading it on the pallet by hand, the Abram Cement Tool Company has designed and is now offering its new Blue Ribbon All-Automatic pallet facing machine. This is a companion to and becomes a part of the Blue Ribbon Autocrat.



Both the facing material and the pallets are placed in their respective large-capacity hoppers. The operator then turns his attention to the Autocrat and gives no further attention to the facer. Taking a faced pallet he places it in the machine and closes the door of the mold box. This transfers the facing material uniformly to the face plate. On making and removing the block from the Autocrat he turns to find a faced pallet awaiting him at his right hand within easy reach. He takes up the faced pallet, places it in the machine, and proceeds as before. While he is making the block, another pallet is being faced for him by the Blue Ribbon Automatic pallet facing machine at his right.

Any type or color of facing material may be used, and applied also to concrete units made with light-weight aggregate.

The Abram Cement Tool Company is located at Detroit, Michigan.

"V" Concrete Body Churns Mix as It Pours

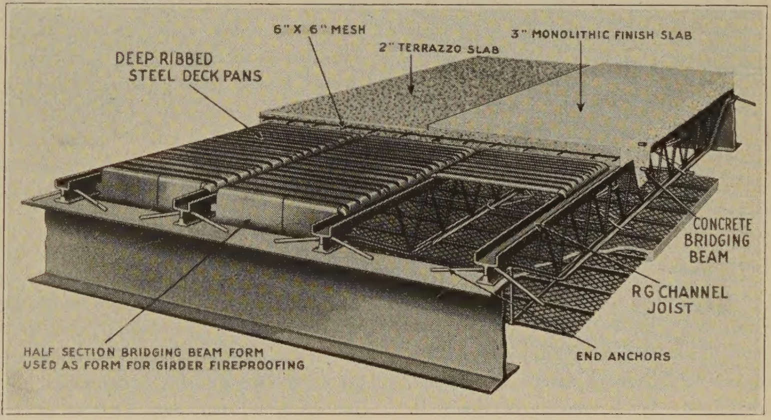
Two features of the Bartlett-Snow Movable V concrete body are its simple design and low initial, operating and maintenance costs. Others are quick loading and discharging, control of discharge, and completely unobstructed body interior which allows the haulage of other bulk materials, according to the C. O. Bartlett and Snow Company, Cleveland, Ohio.

Concrete is carried in the body with the movable side plates together at the bottom in the form of the letter "V." Arriving at the job, the plates are wound back to a vertical position, causing the load to drop and spread over the entire wide horizontal bottom of the body and mixing the mass and the fluid. The body is then tilted and the concrete flows toward the gate and is churned as it passes through and out.

Steel Deck Flooring Lowers Dead Weight

R-G steel deck floor construction is a new development for eliminating useless dead weight in buildings. The features of greatest importance claimed for it are the extreme lightness of the structural floor, the joists and decking weighing only 6 lbs. per sq. ft., and its rigidity, as well as soundness of the finished floor.

The manufacturer describes their field operation as follows: The joists are placed in accordance with usual practice. Temporary bridging, in the form of deformed bars and double No. 14 gauge galvanized wire bridge, is provided at the third points of the channel joists for erection purposes only.


6" X 6" MESH
3" MONOLITHIC FINISH SLAB
2" TERRAZZO SLAB
DEEP RIBBED STEEL DECK PANS
CONCRETE BRIDGING BEAM
RG CHANNEL JOIST
END ANCHORS
HALF SECTION BRIDGING BEAM FORM USED AS FORM FOR GIRDER FIREPROOFING

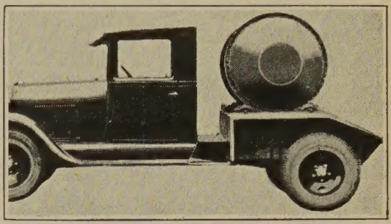
The steel deck pans are laid with the hooked ends turned down into the trough of the joist channels, and wired to the channels through holes in each corner of every deck pan.

At the center of each floor panel forms of heavy gauge metal are hung from the deck pans. The fireproofing forms are next hung from the edge of the deck pans near the girders, the heavy ribbed steel deck pans forming a complete system of interlocked form work without openings.

The Rivet-Grip Steel Company, Cleveland, Ohio, manufactures the steel flooring.

One-Yard and Two-Yard Transit Mixer

The Lee Transit Mixer Co., of Indianapolis (R. F. Lee, president), announces the introduction of a low-cost transit mixer of one-yard and two-yard sizes, mounted on a light chassis of any model of truck. The manufacturer claims that any workman can install or detach the mixer.



For reaching places inaccessible to the delivery truck the mixer drum may be lifted off with a derrick and used as a bottom-dump bucket. This mixer is said to have been developed under actual service conditions in the delivery of ready-mixed concrete to the trade in Indianapolis.

Design Improvement Is Feature of Hoist

A new, complete line of electric hoists in sizes ranging from ⅛ to 7½ ton capacity is announced by the hoist and crane division of Robbins & Myers, Inc., Springfield, Ohio.

A number of outstanding features are incorporated in these new hoists, among which the manufacturer lists: (1) A radical improvement in design with a resultant saving of both weight and space in all dimensions, head-room included. (2) Cast steel trolley adjustable to nine sizes of I-beams. (3) A safety constructed enclosed bottom block which retains the rope on the sheaves and shrouds all parts so as to guide itself easily into the rope flare.

About Makers of Equipment and Materials

NOTES FROM THE FIELD

New Company for Abram Blue Ribbon Machines

The Abram Blue Ribbon Autocrat and line of downface stripper machines will now be manufactured and marketed by the *Blue Ribbon Machine Company,* 7310 Woodward Avenue, Detroit, Mich.

The new organization, which has substantial capital and extensive engineering resources, will be headed by *A. J. Brandt.* Mr. Brandt, formerly of the General Motors Corp., is president of the A. J. Brandt Engineering Company, an international organization of engineers. J. D. Abram, founder of the Abram Blue Ribbon machines, will be associated with Mr. Brandt as vice-president in charge of sales.

Negotiations are being made for a new Detroit factory and production on a larger scale is planned. The new company will offer the concrete products industry a complete line of concrete block, tile, brick and conveying machinery, including complete engineering service on plant design and layout.

Universal and Atlas Become One Company

Announcement has been made that the business of the *Atlas* and the *Universal* Portland Cement companies is now conducted by the *Universal Atlas Cement Company,* subsidiary of the *United States Steel Corporation.*

The Atlas and Universal organizations have been brought together through the Atlas sale to the United States Steel Corporation, of which the Universal company is a subsidiary. Each cement company is a third of a century old.

National Equipment Corporation Becomes Consolidated

The National Equipment Corporation, a consolidation of the *Koehring* and *T. L. Smith* companies of Milwaukee, the *Insley Manufacturing Company* of Indianapolis, the *Parsons Company* of Newton, Iowa, and the *Kwik-Mix Concrete Mixer Company* of Port Washington, Wisconsin, became an operating company on January 1st. Sales, service, advertising and accounting departments have been centralized.

Philip A. Koehring is president and general manager of the National Equipment Corporation, with headquarters at 31st Street and Concordia Avenue, Milwaukee.

R. E. Brooks, for a number of years engaged in the equipment business in New York, was recently elected vice-president and will be in charge of sales.

The officers of the National Equipment Corporation are as follows: *P. A. Koehring,* president and treasurer; *W. H. Insley,* vice-president; *H. E. Smith,* vice-president; *H. C. McCardell,* vice-president; *W. J. Koehring,* vice-president; *R. E. Brooks,* vice-president; *W. J. Zimmers,* secretary; *G. E. Long,* comptroller; *C. A. Koehring,* assistant treasurer.

O. A. Steller Becomes McEverlast Advertising Manager

McEverlast, Inc., manufacturers and distributors of protective coatings for all types of engineering structures and of the Hunt process method of curing concrete, announce the addition of *O. A. Steller* to their headquarters staff at 111 West Seventh Street, Los Angeles.

Mr. Steller, who has been appointed to the position of manager of the advertising department of McEverlast, Inc., comes to his new duties with a background of engineering, technical advertising and editorial experience. The rapid growth of the McEverlast activities in all sections of the United States and in foreign countries has made it necessary to enlarge the general office staff and to center activities having to do with the distribution of information regarding the McEverlast products in this newly created department.

For several years past he has been editor of the magazine CONCRETE. Previous to his connection with CONCRETE, he was employed by the Portland Cement Association in the headquarters office at Chicago. He served this organization both in the road bureau and in the advertising and publication bureau. During the more than 10 years with these two organizations, Mr. Steller has traveled extensively, visiting engineering projects and consulting with engineers in every section of the country. He has contributed engineering articles to a great many engineering magazines and has been active in engineering society attendance.

Besser Sales Manager

Fred Caldwell is now the eastern sales manager of the *Besser Manufacturing Company.* The office is located at 16 Treat Place, Newark, New Jersey. Assisting him in sales is *Will Caldwell* and *Bertram Lenhardt* is in charge of the office and stores depot.

Transportation Firms Combine

The Barrett-Cravens Company, the *Walker Vehicle Company,* both of Chicago, Ill., and the *Automatic Transportation Company, Inc.,* Buffalo, New York, have become associated in ownership and management.

The Barrett-Cravens Company manufacture lift trucks and similar products. The Automatic Company is a pioneer manufacturer of electric industrial trucks and tractors, while Walker Vehicle Company has been manufacturing electric trucks for street use since 1903.

Bushnell Joins Masonite

E. B. Bushnell, a specialist on concrete form construction who formerly was connected with the Portland Cement Association, is now associated with the *Masonite Corporation* in their Chicago office. His duties are to acquaint engineers, builders and contractors with the company's presdwood product, which is being used in concrete form work.

Potts to Handle Colors

The H. H. Potts Company, Chicago, has arranged with the *Ricketson Mineral Paint Works,* Milwaukee, Wisconsin, to handle the latter's full line of cement colors for the concrete products industry.

Industrial Literature

Concrete at Zero

The timely subject of cold weather work is covered in the current issue of the *International Cement Corporation's* monthly folder. Necessary precautions are described, and successful methods used previously are given, in addition to technical data. The latter include several curves, of tests of the effect of temperatures on both compressive strength and hardening of mixtures, and tests to determine the application of the water-cement ratio to cement.

Bartlett & Snow Truck Body

A descriptive bulletin, *No.* 65, published by the *C. O. Bartlett & Snow Company,* Cleveland, Ohio, concerns the truck body for the transportation of premixed concrete. A saving in initial investment of about $15,000 on a ten-truck unit, or $30,000 on a twenty-truck unit, a low daily operating cost, and an increasingly lower maintenance cost each year are advantages particularly stressed.

Photographs show the truck body in action on a number of projects.